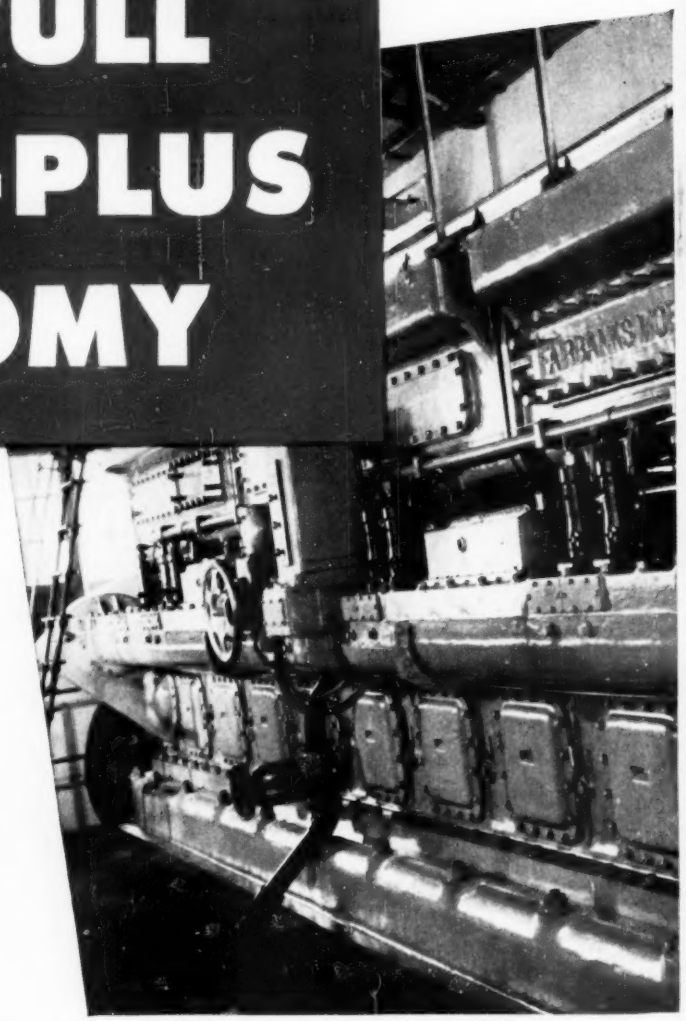
# DIESEL POWER

35¢

## AND DIESEL TRANSPORTATION

JANUARY, 1952

# GETS FULL POWER-PLUS ECONOMY



## ...with the help of TEXACO URSA OILS

As in the plant illustrated, operators of Diesel, gas, and dual-fuel engines everywhere are getting full power and low maintenance costs with the help of *Texaco Ursa Oils*. These oils reduce fuel consumption because they keep rings free, ports open, and valves functioning properly — assuring better compression and combustion.

*Texaco Ursa Oils* are world-famous for their ability to resist oxidation and sludging, to stand up under heat and pressure, and keep engines clean for trouble-free performance. You get longer service life from bearings and all moving parts . . . increased efficiency and reduced maintenance costs.

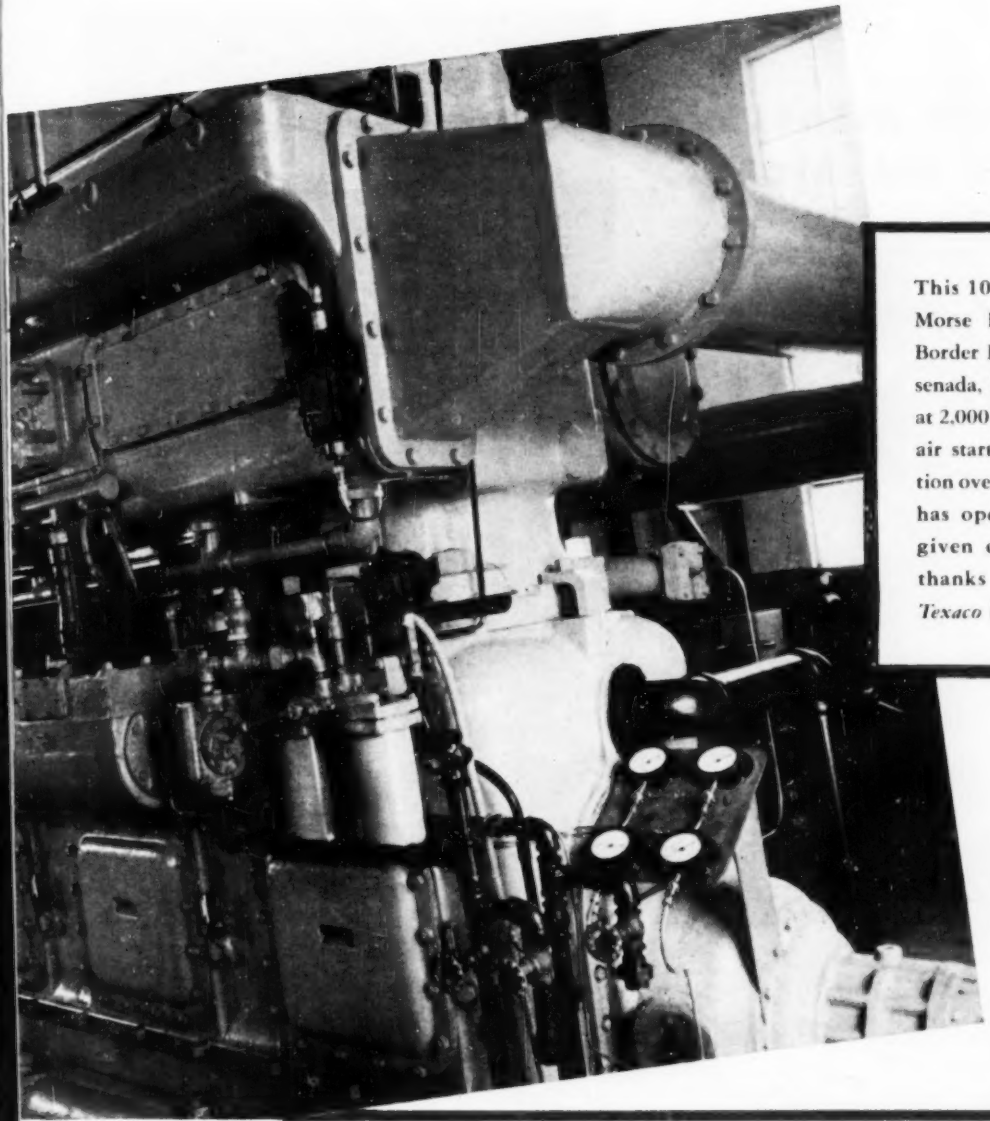
*Texaco Ursa Oils* are available in every needed

TUNE IN . . .
TEXACO STAR THEATER
starring
MILTON BERLE
on television
every Tuesday night.
METROPOLITAN OPERA
radio broadcasts every
Saturday afternoon.

TEXACO

# TEXACO

DIESEL POWER and DIESEL TRANSPORTATION for January, 1952, Vol. XXX, No. 1. It is published monthly by Diesel Publications, Inc., Orange, Conn. Executive and Editorial offices at 192 Lexington Ave., New York 16, N. Y. Subscription rates: United States, $3.00 per year, single copies 35¢; Canada $4.00; Foreign $5.00 per year. Entered as second class matter April 29, 1949 at the Post Office, Orange, Connecticut under Act of March 3, 1879.



This 10-cylinder Fairbanks-Morse Diesel engine in the Border Electric Company's Ensenada, Mexico, Plant is rated at 2,000 h.p. at 300 rpm, and is air starting. Since its installation over a year ago, this Diesel has operated smoothly and given economical power — thanks to lubricating with *Texaco Ursa Oils exclusively.*

viscosity. Approved by leading engine manufacturers and recommended by users from coast to coast, they are easily America's favorite. In the Diesel field alone:

*For over 15 years, more stationary Diesel h.p. in the U. S. has been lubricated with Texaco than with any other brand.*

A Texaco Lubrication Engineer will gladly show you how *Texaco Ursa Oils* will reduce costs in your operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

**URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES**

*Faithfully yours* 50 *for Fifty Years*

## SERVING THE DIESELS THAT SERVE AMERICA...

# DELCO-REMY

ELECTRICAL EQUIPMENT

*Delco-Remy heavy-duty 12-volt cranking motor, with frame-mounted switch.*

In almost every industry—in thousands of applications—Diesel engines have proved their economy and dependability as a source of power.

And Delco-Remy provides the electrical equipment for many of these powerful Diesels.

To user and manufacturer alike, the Delco-Remy name is a symbol of fine electrical equipment . . . equipment that helps keep their Diesels on the job.

UNITED SERVICE MOTORS

DELCO-REMY—
A UNITED MOTORS LINE
Service Parts and Delco Batteries
Available Everywhere Through
UNITED MOTORS DISTRIBUTORS

**Delco-Remy**
DIVISION, GENERAL MOTORS CORPORATION
ANDERSON, INDIANA

DELCO-REMY • WHEREVER WHEELS TURN OR PROPELLERS SPIN

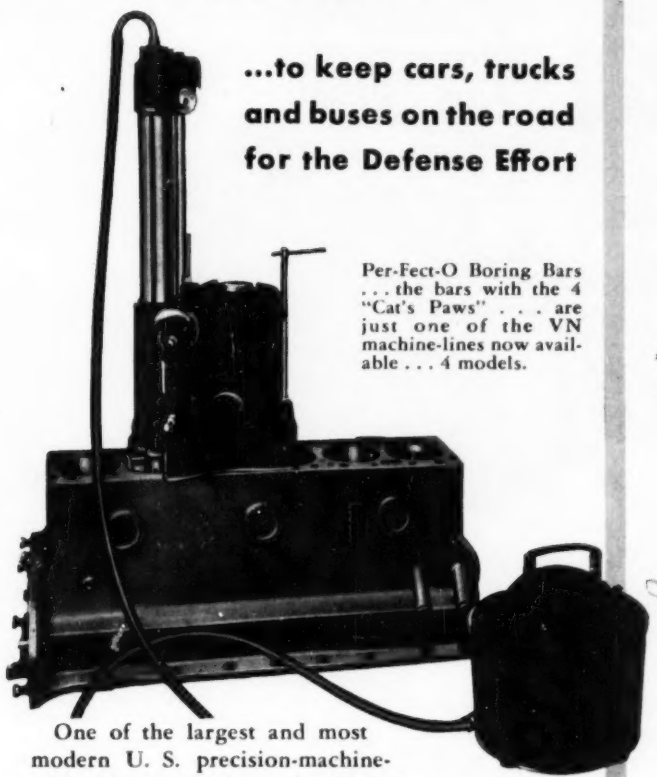
# VAN NORMAN

## is building

## *All these Machines*

# NOW!

**...to keep cars, trucks and buses on the road for the Defense Effort**

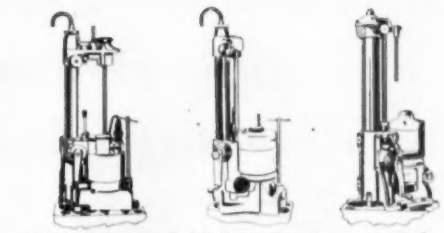


Per-Fect-O Boring Bars . . . the bars with the 4 "Cat's Paws" . . . are just one of the VN machine-lines now available . . . 4 models.

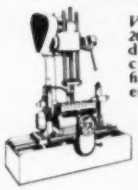
One of the largest and most modern U. S. precision-machine-tool plants, Van Norman's 400,000 square feet of floor space is rolling out automotive service equipment as never before . . . *all the machines shown on this page* . . . to keep cars, trucks and diesels in continuous operation. So see your jobber . . . or write Van Norman Co., Springfield 7, Mass.

**"Get it From Your Jobber"**

*"It pays to Van Normanize"*

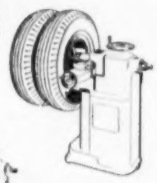


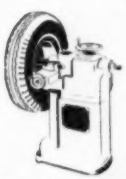
*Van Norman Per-Fect-O Boring Bars* bore the cylinders . . . to factory-accuracy . . . in one quick cut per cylinder.

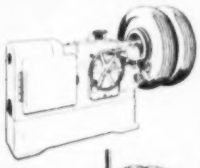


*Van Norman No. 200 Wet Honer* duplicates the cylinder-wall finishes of the engine-builders.

*Van Norman No. 232 "Pin Shop"* fits piston pins to pistons and rods . . . also reconditions con-rod forgings.

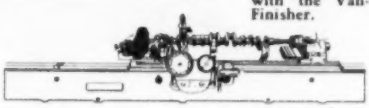


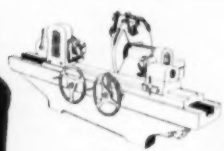


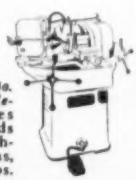


*Van Norman Brake Lathes* recondition all brake drums, from the smallest car drums, to the largest bus, truck, and airplane drums.

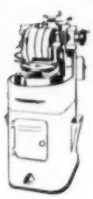
*Van Norman Crankshaft Regrinders* take all shafts. And each model may be equipped with the Van-O-Lite Finisher.

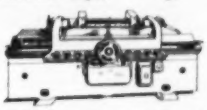






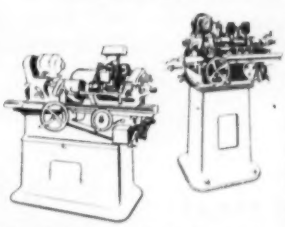
*Van Norman No. 500-B Valve Regrinder* refaces valves...also grinds valve-stems, push-rods, rocker-arms, and con-rod caps.





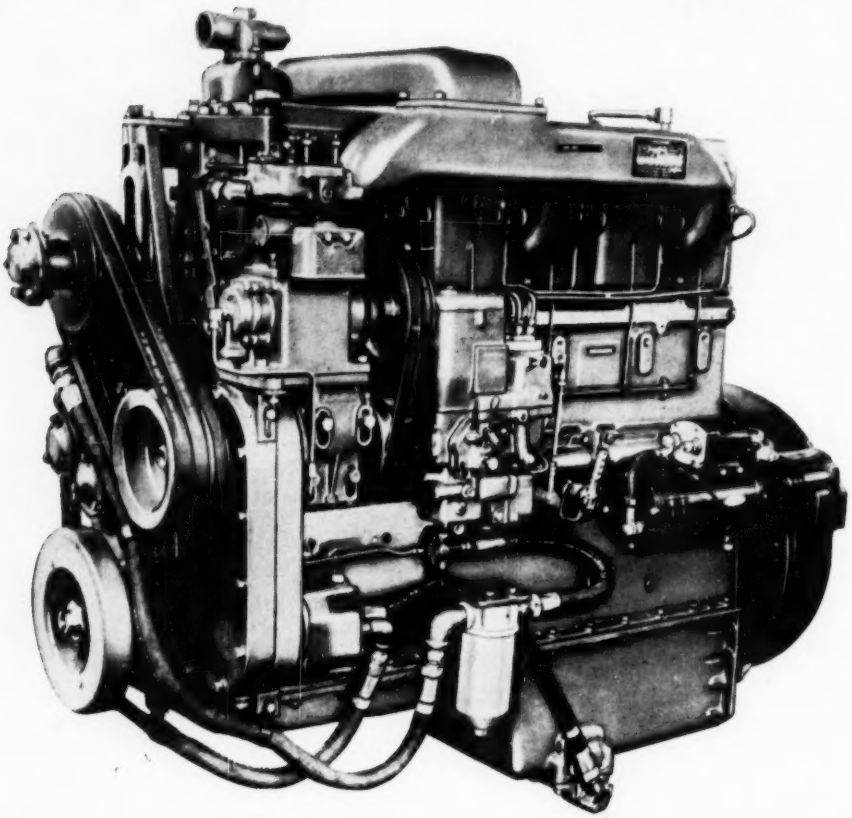
*Van Norman No. 565 Cylinder Head-Block Top Grinder*

*Van Norman No. 444 Rotary Surface Grinder* resurfaces clutch plates, and the clutch sides of flywheels, and many other grinding operations.



*Van Norman Cam Piston Grinders* grind all pistons to factory accuracy.

# 275,000-mile overhaul proves amazing lack of engine wear with Air-Maze full-flow oil filter!



**THE PERFORMANCE** of the Air-Maze type "O" full-flow oil filter on the engine above proves again how Air-Maze lube oil filters save engine wear.

After 275,000 miles, Consolidated Copperstate Lines of Los Angeles disassembled this "NH" series Cummins Diesel engine and carefully checked the parts for wear. The following figures show that wear was almost negligible:

| | |
|---|---|
| *Cylinder sleeve wear* | *.0015 to .0025* |
| *Connecting rod bearing wear* | *.002 to .0025* |
| *Main bearing wear* | *.001 to .0015* |
| *Crankshaft throw journal wear* | *.0005* |
| *Crankshaft main journal wear* | *.0005* |

The crankshaft itself checked for straightness. There were no cracks. After polishing, the shaft was replaced *without grinding!* The Air-Maze full-flow lube oil filters had effectively removed abrasive dust and dirt from the oil, kept engine wear to a minimum.

Air-Maze's specially *engineered* disc-type design provides unusually large filtering area in small space with low pressure drop. Full-flow oil filters are available in open-circuit units to fit cored cavities or in closed-circuit units for external mountings as shown above. Construction is all-metal. Cleaning is easy.

For help with your filter problems, contact your nearby Air-Maze representative or write Air-Maze Corporation, Cleveland 5, Ohio.

*The biggest names in diesels are protected by Air-Maze filters*

**AIR FILTERS**
**SILENCERS**
**SPARK ARRESTERS**

**AIR-MAZE**
**THE FILTER ENGINEERS**

**LIQUID FILTERS**
**OIL SEPARATORS**
**GREASE FILTERS**

# CYCLAN

Try new Cyclan ring material for tough service in heavy duty Diesel and Gas Engines

**1**

CYCLAN is tough, with plenty of tension, but not brittle

**2**

CYCLAN has twice the breakage resistance of ordinary iron

**3**



CYCLAN retains tension up to 700° F.

**4**

CYCLAN withstands impact, hammering, flexing

**5**

CYCLAN withstands considerable distortion without losing shape

**6**

CYCLAN resists wear far better than standard ring iron

Available for rings up to 9" diameter.
*Write for complete information*

SEALED POWER CORPORATION
MUSKEGON, MICHIGAN

## Sealed Power

**PISTON RINGS · PISTONS**
**CYLINDER SLEEVES**

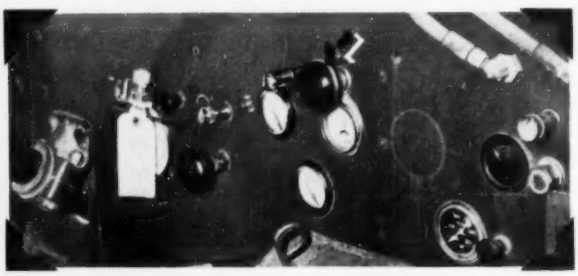
# STANDARD ENGINEER'S REPORT

DATA

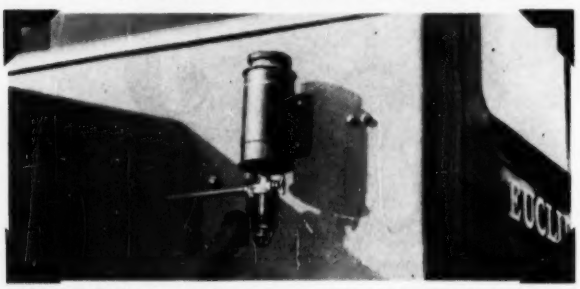
| | |
|---|---|
| PRODUCT | Chevron Starting Fluid |
| UNITS | Diesel engines |
| CONDITIONS | Sub-zero temps — high altitudes |
| EQUIPMENT | Permanent primers with atomizers on manifolds |
| FIRM | The Utah Construction Co. Cedar City, Utah |

# Four hours saved daily starting 13 diesels!

TRUCKS LIKE THIS, when primed with Chevron Starting Fluid last winter, averaged only a minute and a half starting time in temperatures down to 26° below zero. Previously, it took 20 minutes to start each of the 13 units operated by the Utah Construction Co. at

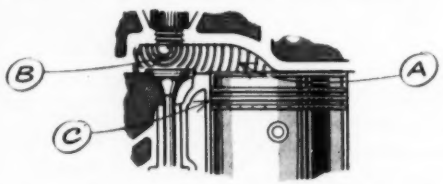


mile-high Cedar City, Utah. This meant a saving of four hours a day in starting time alone. A dash-mounted pump (arrow) in each unit forces Chevron Starting Fluid through atomizers into the manifold and primes the engine for fast starting.



STORAGE TANK for bulk Chevron Starting Fluid is here mounted near the engine. The fluid also comes in 7- and 17-CC gelatin capsules. These capsules are placed in a puncturing tool and fluid is pumped into intake manifold the same way as from the central bulk tank shown. Each type of dispensing equipment is suitable for both diesel and gasoline engines and is available from your starting fluid supplier. Chevron Starting Fluid is approved by leading engine manufacturers.

## How CHEVRON Starting Fluid Starts Gasoline and Diesel Engines Instantly




A. Atomizes in lowest temperatures and provides powerful, easily ignited vapor in combustion chamber.

B. Pressure, or the weakest spark, fires mixture—turns engine and heats air for regular fuel mixture.

C. Contains lubricant and additives—inhibits cylinder wear and ice formation in primer equipment.

HOT NEWS — COLD ENGINES

FREE BOOKLET gives you more facts on Chevron Starting Fluid—shows where it should be applied in different type engines. Write or ask for it today.

CHEVRON STARTING FLUID

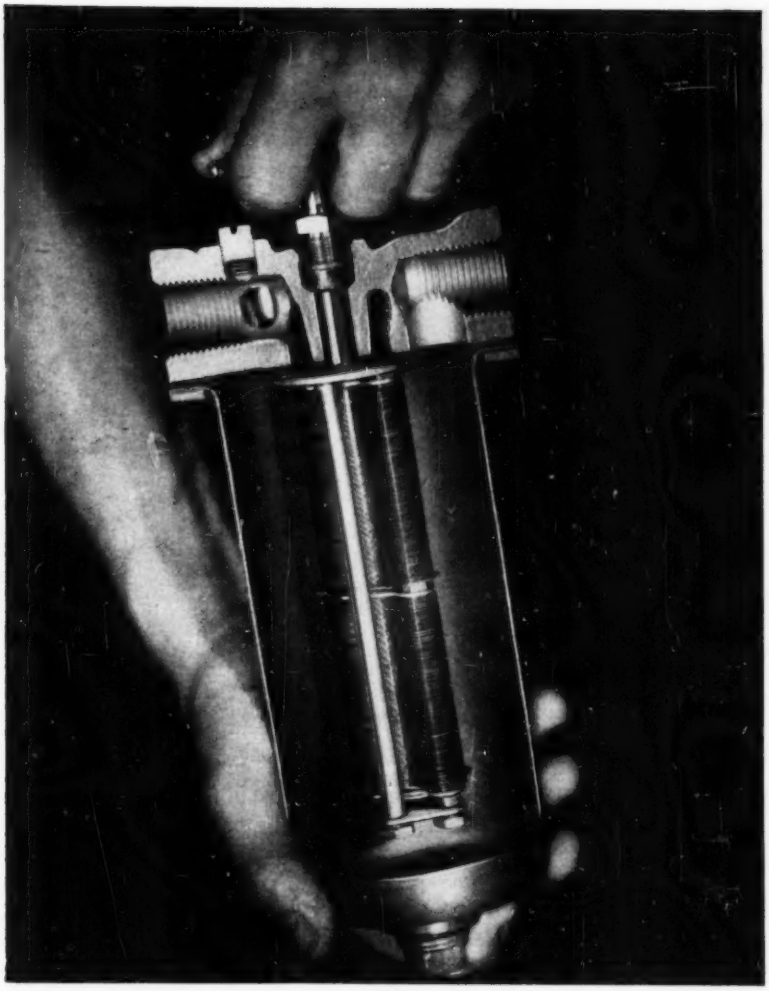
TRADEMARK REG. U.S. PAT. OFF.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas



# You Can Clean This Fluid Strainer Without Stopping the Flow

Cuno AUTO-KLEAN is the *only* fluid strainer with "comb-action cleaning" which permits it to work uninterruptedly. Dirt accumulations are dislodged *while* the straining goes on. This can be done automatically. *Guaranteed* to remove 100% of all solids larger than specified.

CUNO

*Fluid Conditioning*

**Removes More Sizes of Solids from More Kinds of Fluids**

**Strain** fuels, lubricants, process fluids, etc.—AUTO-KLEAN
**Filter** fuels, lubricants, process fluids, etc.—MICRO-KLEAN
**Clean** raw water, recirculating water, etc.—FLO-KLEAN

## No Risks With Discs

The all-metal disc element in Cuno AUTO-KLEAN positively cleans lube and fuel oil of all solids larger than specified.*

This compact strainer handles full flow in minimum space. When the strainer itself needs cleaning, you don't have to stop the engine.

When the disc element is rotated—manually or automatically—cleaner blades "comb out" all accumulations between the discs, no matter how sticky or deeply embedded.

## The Indestructible Strainer

This "comb-action" type of cleaning is much more thorough than mere surface-scraping. It restores full initial capacity and free area. And there's no danger of pushing dirt through the strainer into the discharge flow.

The discs are permanent, non-collapsible, unbreakable. No chance of an unsuspected gap or channel to occur, permitting passage of harmful solids. And—nothing to wear out and need replacing.

Cuno AUTO-KLEAN Strainers are available for built-in or external installation. Continuously cleanable feature permits single unit installation. Straight-line connections for simplicity of installation on either fuel or lube.

*Models available for straining from .0056 to .062 in.

**Cuno Engineering Corporation**
**Dept. 255A, South Vine Street, Meriden, Conn.**

Please send information on Cuno AUTO-KLEAN Strainer for Diesel protection.

Name.....

Company.....

Address.....

City.....Zone....State.....

*Please attach to business letterhead*

# Now Turbocharged

## TO PRODUCE GREATER HP AT THE SAME MEDIUM SPEEDS

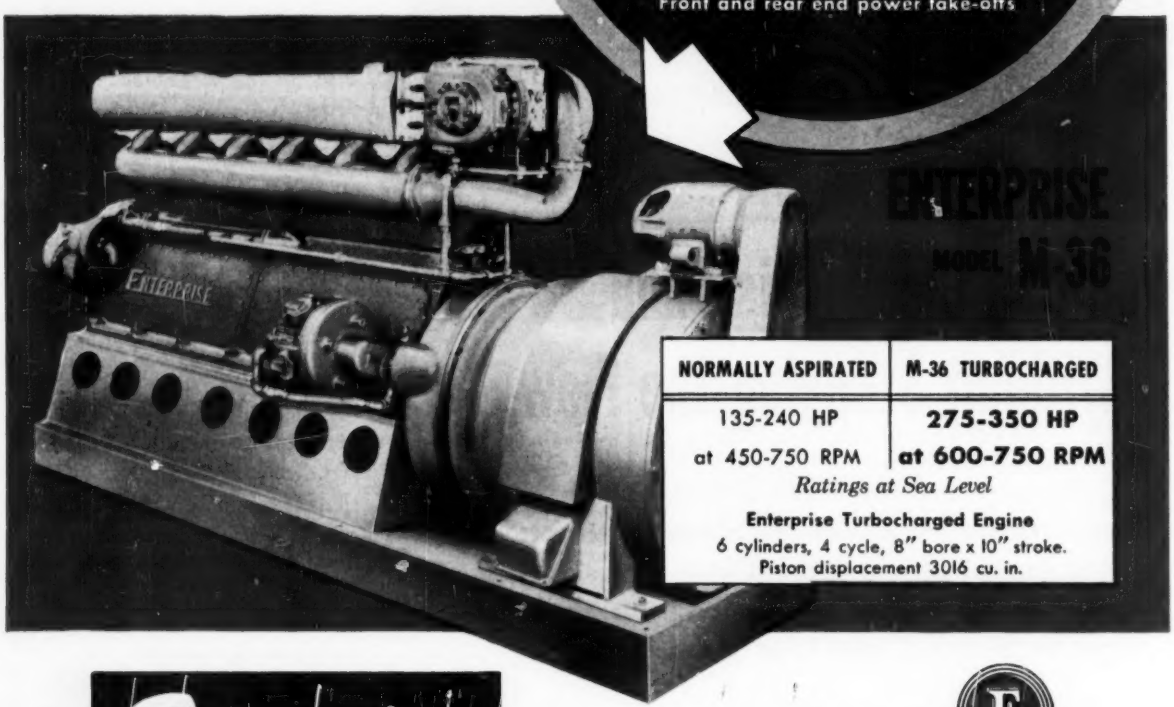
Here's the diesel specifically designed for Turbocharging.

Together with this advancement in low power heavy duty engines is the unmatched efficiency made possible through Enterprise intercooling. This development permits the engine to maintain uniform mean cycle temperatures comparable to normally aspirated engines—without increasing thermal stresses and bearing loads.

Get complete information today. See why Enterprise offers the best in heavy-duty, continuous service, medium speed diesels—for every stationary power use.

**ENTERPRISE OFFERS ALL THESE OUTSTANDING FEATURES IN TURBOCHARGED DIESELS OF THE LOW HP RANGE**

- Solid injection, individual fuel pumps
- Enterprise intercooling
- Efficient performance on low cost fuels
- Low fuel consumption
- Smooth, quiet, vibration-free operation
- Integrated design, easy accessibility
- Clean running, low maintenance
- Rugged construction, continuous round-the-clock operation
- Front and rear end power take-offs




| NORMALLY ASPIRATED | M-36 TURBOCHARGED |
|---|---|
| 135-240 HP | **275-350 HP** |
| at 450-750 RPM | **at 600-750 RPM** |

*Ratings at Sea Level*

**Enterprise Turbocharged Engine**
6 cylinders, 4 cycle, 8" bore x 10" stroke.
Piston displacement 3016 cu. in.

**Enterprise**
DEPENDABLE
**Diesels**

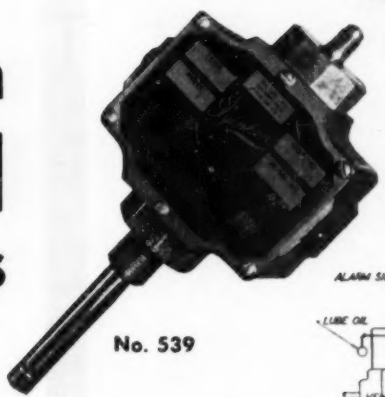
*The Choice of Power Experts*

**ENTERPRISE ENGINE & MACHINERY CO.**
A Subsidiary of General Metals Corporation
18th & Florida Streets, San Francisco 10, California

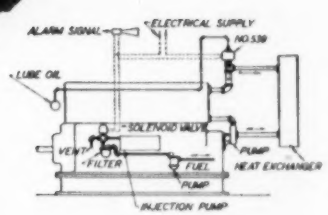
# Why take chances on engine trouble?

No. 923-3

## Depend on SYLPHON controls



No. 539




*Typical installation of No. 539.*

YOU NEVER NEED to cross your fingers—or trust to luck—with these Sylphon controls. When they're on the job, they safeguard you against engine trouble—day and night. They help ward off costly shutdowns, damage or repairs.

No. 539 control gives positive protection against high jacket water temperature or low lube oil pressure. If water jacket temperature goes above, or lube oil pressure goes below safe limits, it sounds an alarm—or shuts off the engine. Also available for temperature or pressure only.

No. 923-3 Regulator is equally dependable. It thermostatically controls cooling water circulation—keeps engine jacket temperature right. Can be manually operated—if and when desired!

Both controls are ideally suited to diesel, gas or other internal combustion engines. Self-contained and self-powered, they're built to give you long, trouble-free service. Easily installed. For complete information, send for Bulletin DA-817.

FIRST WITH BELLOWS

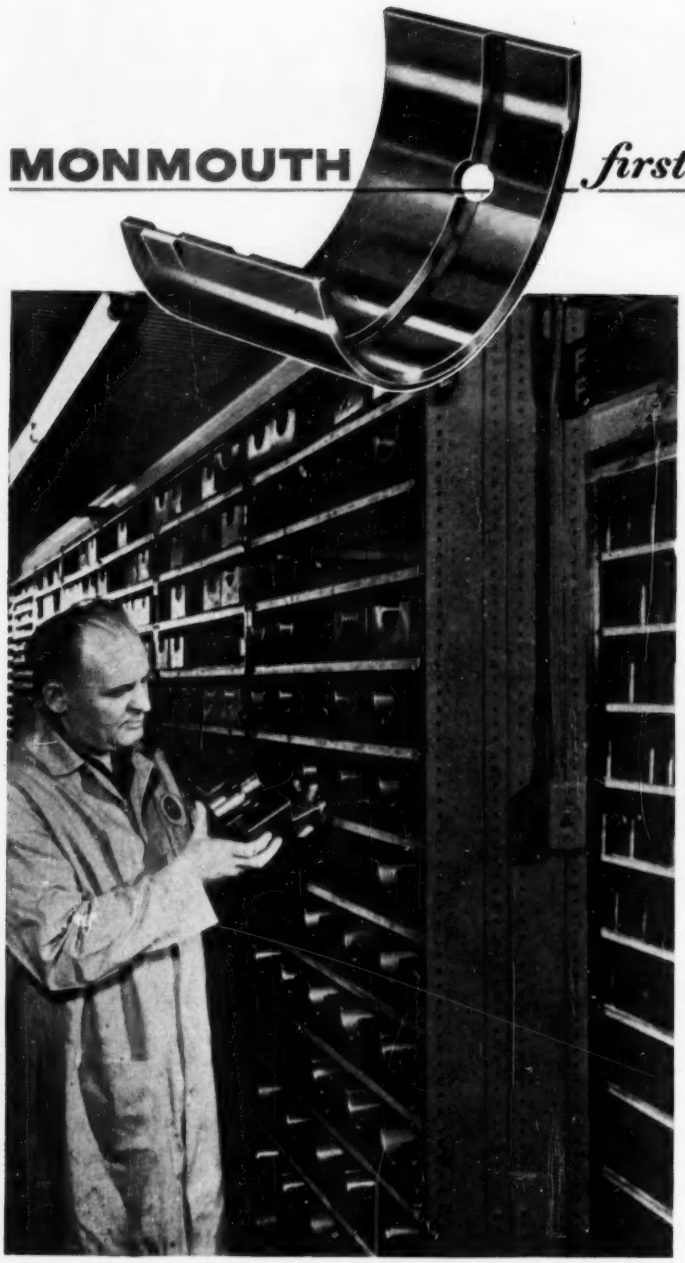
*Temperature Controls • Bellows Devices • Bellows Assemblies*

**FULTON SYLPHON**
DIVISION

ROBERTSHAW-FULTON CONTROLS CO., KNOXVILLE 4, TENN.

*Canadian Representatives, Darling Brothers, Montreal*

**MONMOUTH** *first with the finest*



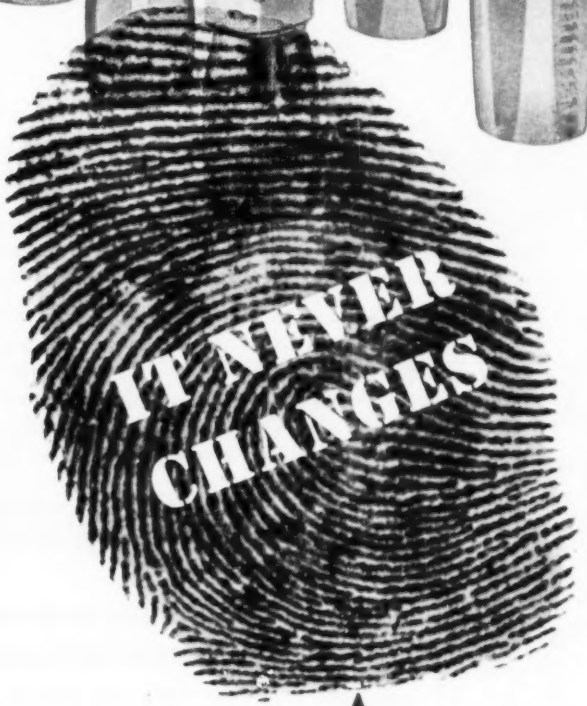
## He stores a million dollars worth of **accuracy** here!

THIS man is responsible for the tools and dies that check and make the many Monmouth Bearings so essential to the servicing of bearings for automobiles and trucks as far back as the twenties. Some of these dies and tools are so accurately finished, special gauges are required to measure them.

This kind of precision from tools to finished products is responsible for the dependability and satisfaction built into all Monmouth Bearings. If you want to be sure that the part you sell or use is the finest, just look for the Monmouth label—it is proof that you have the first in the field, and the finest modern machinery and methods can produce.

**THE CLEVELAND GRAPHITE BRONZE CO.**
REPLACEMENT SALES DIVISION
6543 Carnegie Ave. • Cleveland 3, Ohio

**CGB FIRSTS:** The development of continuous strip casting, 1929—thinwall babbitt lined steel-backed bushings, 1931—continuous casting of copper lead on steel strip, 1934—tri-metal bearings, 1938—Micro Bearings, 1939—Clevite 77, 1944—and others which have helped to revolutionize the lined bearing industry.




**Always the same** . . . product quality that never varies . . . that's the secret of Aeroquip's leadership. Nothing is spared in time, money and effort to obtain the newest, most accurate inspection equipment to assure the Aeroquip standard, highest in the industry. That is why Aeroquip Products are "Always First" in quality.

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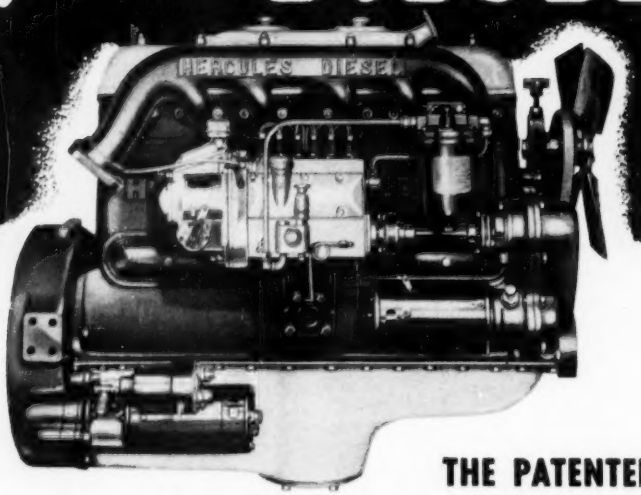
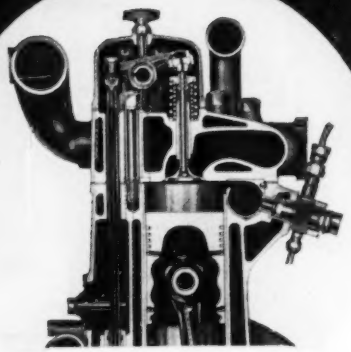
AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

# *Operating economy starts with* HERCULES DIESEL ENGINES



## THE PATENTED HERCULES COMBUSTION CHAMBER!

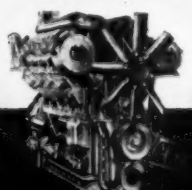
The universal acceptance of Hercules lightweight, high-speed, heavy-duty diesel engines is reflected in the sound engineering and outstanding design characteristics of the Hercules patented combustion chamber. It is designed to greatly increase the velocity of the air passing into the combustion chamber. When the air velocity reaches its maximum—fifty times crankshaft speed—the fuel is injected. This assures the complete mixing of the fuel and air, complete combustion at the right time and at the proper rate of burning. This results in: the highest possible expansion of the burned gases . . . exceptionally high operating efficiency . . . low fuel consumption—(since all fuel is completely burned) . . . clean exhaust . . . a minimum of smoke and noise. To install Hercules diesel engines is to secure the full benefits of the Hercules patented combustion chamber.

Hercules diesel engines are built in a broad range of sizes and displacements, from 12 to 500 horsepower, with automotive type of mounting or as enclosed, open or base type power units. They are parallel in mounting dimensions and performance with Hercules gasoline engines of similar displacement. Call in a Hercules engineer to discuss your future diesel power requirements.

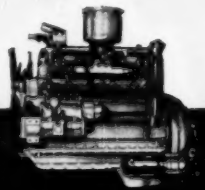
| Model | Bore and Stroke Inches | Piston Displ. Cubic Inches |
|---|---|---|
| **TWO CYLINDER DIESEL** | | |
| DIXC | 4" x 4½" | 113.1 |
| DIXD | 4¼" x 4½" | 127.5 |
| **FOUR CYLINDER DIESEL** | | |
| DIX4B | 3¼" x 4" | 133 |
| DIX4D | 3⅜" x 4" | 166 |
| DOOB | 3¾" x 4½" | 198.8 |
| DOOC | 4" x 4½" | 226.2 |
| DOOD | 4¼" x 4½" | 255 |
| **SIX CYLINDER DIESEL** | | |
| DJX6D | 3⅜" x 4" | 248 |
| DJXB | 3½" x 4½" | 260 |
| DJXC | 3¾" x 4½" | 298 |
| DJXH | 3¾" x 4½" | 298 |
| DJXHF | 3¾" x 4½" | 298 |
| DWXC | 4" x 4¾" | 358 |
| DWXCF | 4" x 4¾" | 358 |
| DWXD | 4¼" x 4¾" | 404 |
| DWXDF | 4¼" x 4¾" | 404 |
| DWXLD | 4¼" x 5" | 426 |
| DWXLDF | 4¼" x 5" | 426 |
| DRXB | 4⅝" x 5¼" | 474 |
| DRXC | 4⅝" x 5¼" | 529 |
| DFXB | 5" x 6" | 707 |
| DFXC | 5¼" x 6" | 779 |
| DFXD | 5½" x 6" | 855 |
| DFXE | 5⅝" x 6" | 895 |
| DFXH | 5¾" x 6" | 935 |
| DFXHF | 5¾" x 6" | 935 |
| **EIGHT CYLINDER DIESEL** | | |
| DNXV-8B | 5¾" x 6" | 1247 |
| DNXV-8C | 6" x 6" | 1348 |
| DNXV-8D | 6¼" x 6" | 1468 |
| DNXV-8DS | 6¼" x 6" | 1468 |

### *OUTSTANDING ADVANTAGES*

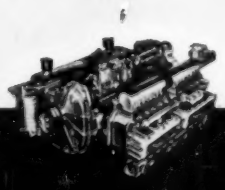
- TOP OPERATING ECONOMY
- PROVEN PERFORMANCE
- LONG LIFE SERVICE
- SMOOTH FLEXIBLE POWER
- LOW MAINTENANCE
- HIGH-SPEED HEAVY-DUTY SERVICE



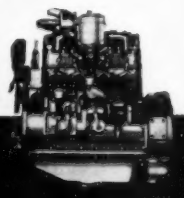
Model DNXV-8 Eight Cylinder Vee Type



Model DJX6D Six Cylinder

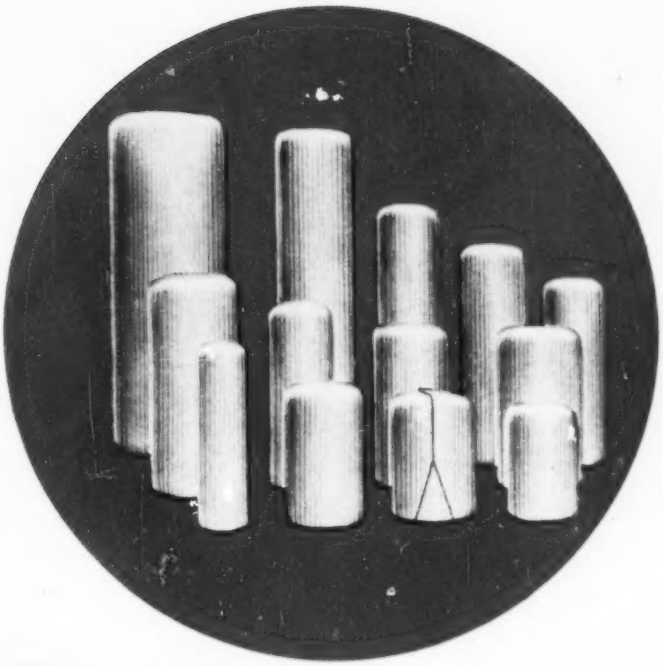


Model DFXHF Six Cylinder Pancake Type



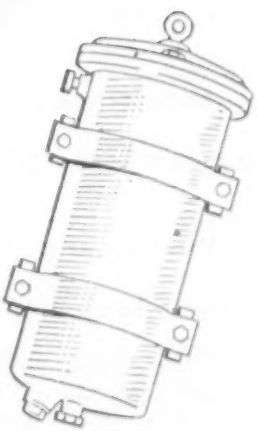
Model DIX4D Four Cylinder

**HERCULES MOTORS CORPORATION • *Canton, Ohio, U.S.A.***



# there's a WINSLOW ELEMENT for any FILTER*

More and more, as the national emergency makes it imperative that you protect your engines against the danger of being unable to replace or repair them, your maintenance program must provide for dependable filtration of fuels and lubricants. The urgency of your need makes it doubly worth your while to remember that Winslow manufactures over 200 sizes and shapes of fine elements. There's a Winslow Element for any make or model of filter that you may own!

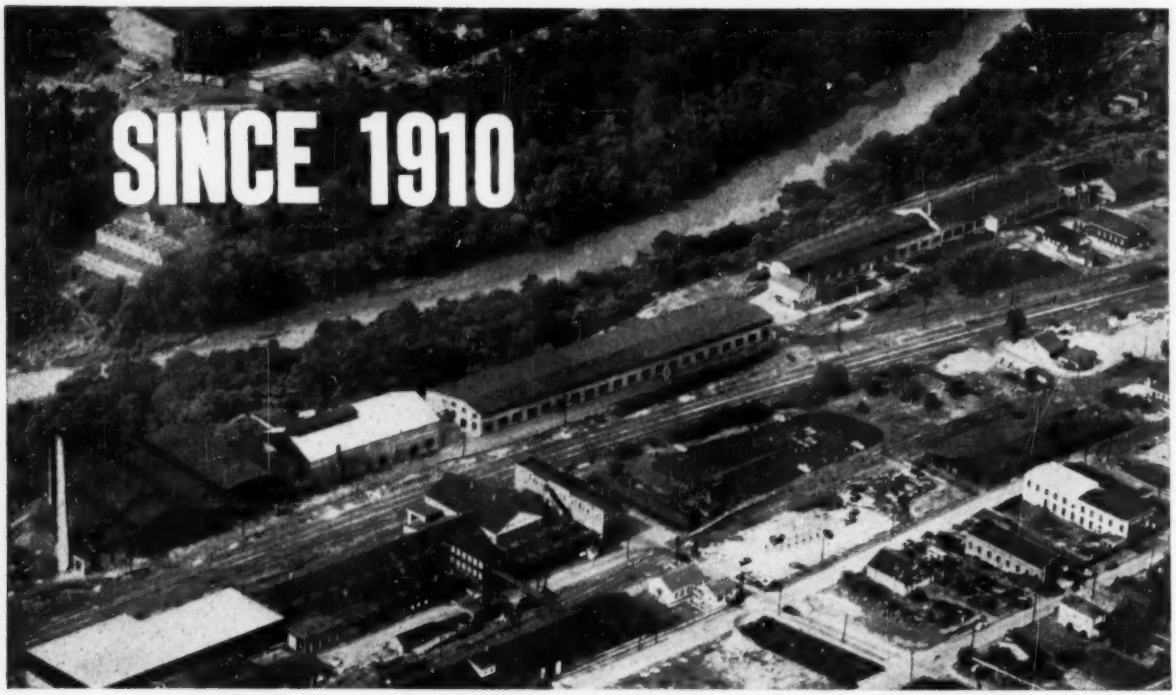


**WRITE FOR YOUR COPY OF OUR POPULAR BOOKLET, "THE CASE OF THE DIRTY DRIP." *IT'S FREE!***

**WINSLOW FILTERS**

*there's a WINSLOW FILTER for any ENGINE

W-512 **Winslow Engineering Company** 4069 Hollis Street • Oakland 8, California




This aerial view of our plant will give you a good idea of our facilities for turning out crankshafts and forgings for diesels.

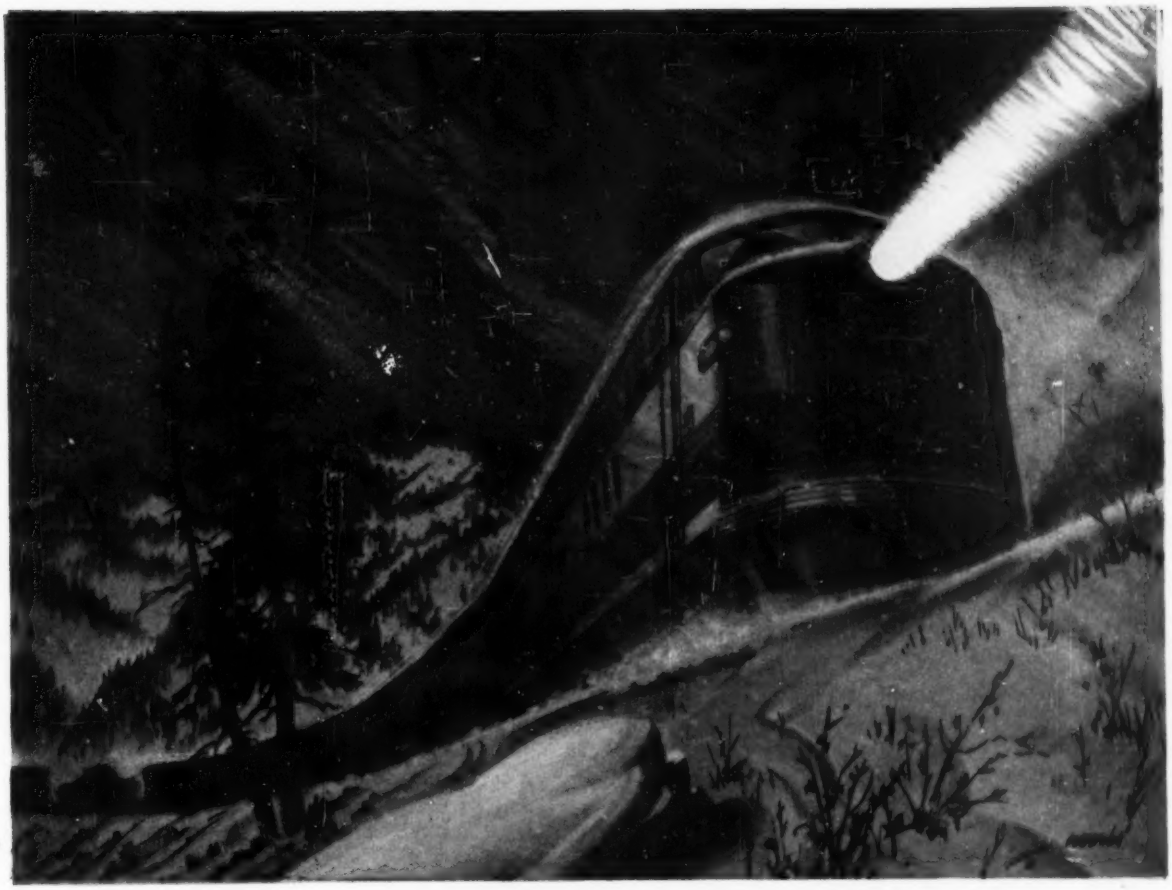
We have been at it since 1910, during which time we have been furnishing a constant and steady supply of crankshafts and forgings for use on diesel engines.

Manufacturers of diesels rely upon Ellwood City Forge for their most exacting requirements. We never disappoint them.

We suggest you write or look in on us for your crankshafts and forgings. We can take care of your needs in a thoroughly satisfactory manner.

# *Ellwood City Forge Company*

ELLWOOD CITY PENNSYLVANIA



# tough jobs — EVERYWHERE — demand AMERICAN BOSCH performance

Today's sweeping preference for Diesel locomotives results from their ability to do the toughest jobs with greater economy, efficiency and dependability. That's why American Bosch fuel injection equipment is used on so many Diesel locomotives.

Diesel fuel injection systems must meticulously measure and pump the precise amount of oil into each engine cylinder — timed and atomized for greatest combustion efficiency. Pumps and nozzles must be made far more accurately than the finest watch — yet stand-up under thousands of hours of operating heat and vibration. The success of American Bosch systems in such operation is evidenced in their use by the majority of Diesel engine manufacturers.

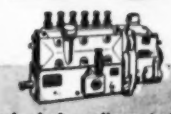
Nearly two million man-hours of research and engineering have gone into American Bosch fuel injection equipment alone. Such thorough design and development — coupled with rigid standards of precision manufacture and skilled service — indicate why American Bosch products are held in such high regard in the automotive, aviation and Diesel fields. American Bosch Corporation, Springfield 7, Mass.

# AMERICAN BOSCH

Top quality Magnetos for over 40 years.

High-performance, trouble-free Generators and Regulators.

Continuous-action, all-electric Windshield Wipers.



Standard of excellence in Diesel Fuel Injection Equipment.

Precision components for aircraft engines.

# FLEXINEERING

## PENFLEX'S ANSWER TO YOUR FLEXIBLE TUBING PROBLEMS

An extra man to help you plan new products requiring flexible tubing or to solve problems on old products. That's the service Penflex's "Flexineering" offers you. Flexineering is the scientific application of the right size, weight and type of flexible tubing on the right installation or product to assure the longest life with the greatest efficiency.

Coast to coast . . . border to border, Penflex installations prove the value of "Flexineering."

When you require tubing or hose that is as tight as a pipe but flexible, safe at high temperatures . . . free from metal fatigue . . . specify Penflex.

Penflex manufactures a complete line of four wall interlocked and seamless welded corrugated flexible tubing in sizes from 1/8" to 30" I.D. Write today for your copy of "Flexineering."

**Pennsylvania Flexible Metallic Tubing Company, Inc., 7236 Powers Lane, Phila. 42, Pa.**

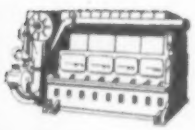
***Branch Sales Offices:*** **Boston • New York • Chicago • Houston • Cleveland • Los Angeles**

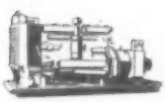
penflex

**HEART OF INDUSTRY'S LIFE LINES**

# Diesel Engine Staying Power

# Upped





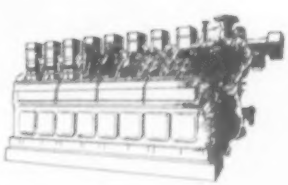
## BY THESE 4 STEPS

**1st step:** Examine Cities Service lubricants for out-and-out quality through your purchasing experts or test facilities . . . or from service records established by critical users.

**2nd step:** Look into the completeness of the Cities Service line as an aid to simplified ordering and prompt, steady supply . . . backed by the extensive facilities and intensive cooperation to keep you out of any lubrication "jam."

**3rd step:** Review today's most effective Diesel lubrication practices by consulting that fully informed specialist, the Cities Service Lubrication Engineer.

**4th step:** Ask for facts about the high character of the Cities Service line and the practical technical assistance now upping Diesel staying power for many of industry's "hardest drivers." Phone or write CITIES SERVICE OIL COMPANY, **Dept. A12,** Sixty Wall Tower, New York City 5.

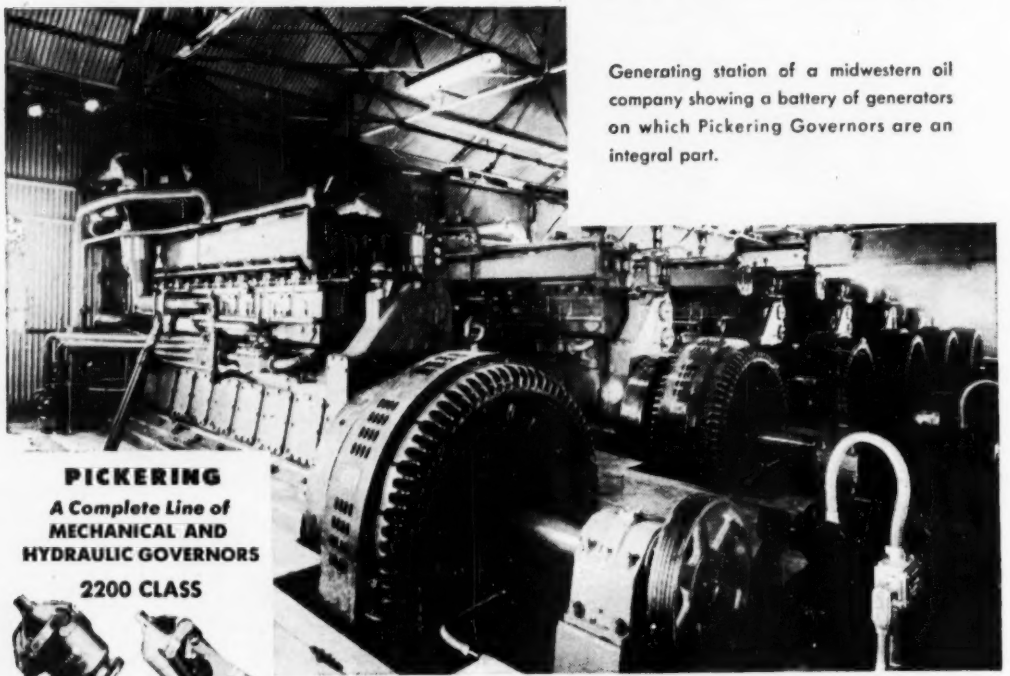


**CITIES SERVICE**

**QUALITY PETROLEUM PRODUCTS**

# PICKERING

**Synonym for dependability since 1862**



Generating station of a midwestern oil company showing a battery of generators on which Pickering Governors are an integral part.

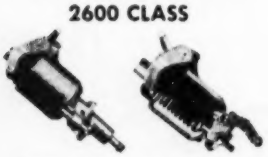
**PICKERING**

***A Complete Line of***
**MECHANICAL AND HYDRAULIC GOVERNORS**

**2200 CLASS**

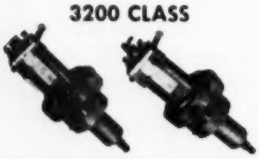
Constant Speed Variable Speed

**2600 CLASS**



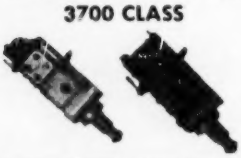
Constant Speed Variable Speed

**3200 CLASS**



Constant Speed Variable Speed

**3700 CLASS**



Constant Speed Variable Speed

For 89 years, Pickering Governors have met and anticipated the needs of American Industry. They have more than established a reputation for fully-dependable, long-term service under every type of operating condition.

Today, Pickering stands ready to supply the right governor for the job – to supply the governor that will maintain operating efficiency at its peak regardless of service conditions.

To consult Pickering Engineers may be your passport toward more efficient and economical operation of diesel equipment.

**THE PICKERING GOVERNOR CO.**

*Established 1862*

**88 LLEWELLYN AVENUE · BLOOMFIELD, NEW JERSEY**

7614

# Blanket Lift

Boot leather was bitter, but better than starving. To keep their feet from freezing, they wrapped them in blankets — and found the blankets served as snowshoes!

That's what Fremont and his men needed — as critically as the wearing surfaces of Diesel engines need renewal.

But Diesel owners aren't waiting for the "boot eating" stage. They know the parts shortage can be as severe as the 1848 blizzard that caught Fremont's expedition in the Rockies.

Carloads of worn out liners — and crankshafts too — are being saved from the scrap heap with VANDERLOY M. At our new plant (largest of its kind in existence) this pure, electrolytic iron restores such parts to original dimensions.

Then, with PORUS-KROME* added, they go back into service — and earn up to four times the total processing cost.

To avoid a risk such as Fremont's, many Diesel users make sure of their equipment by having it Van der Horst processed when new. They find it a blanket answer to problems of wear and performance — and gives a blanket lift to their profits.

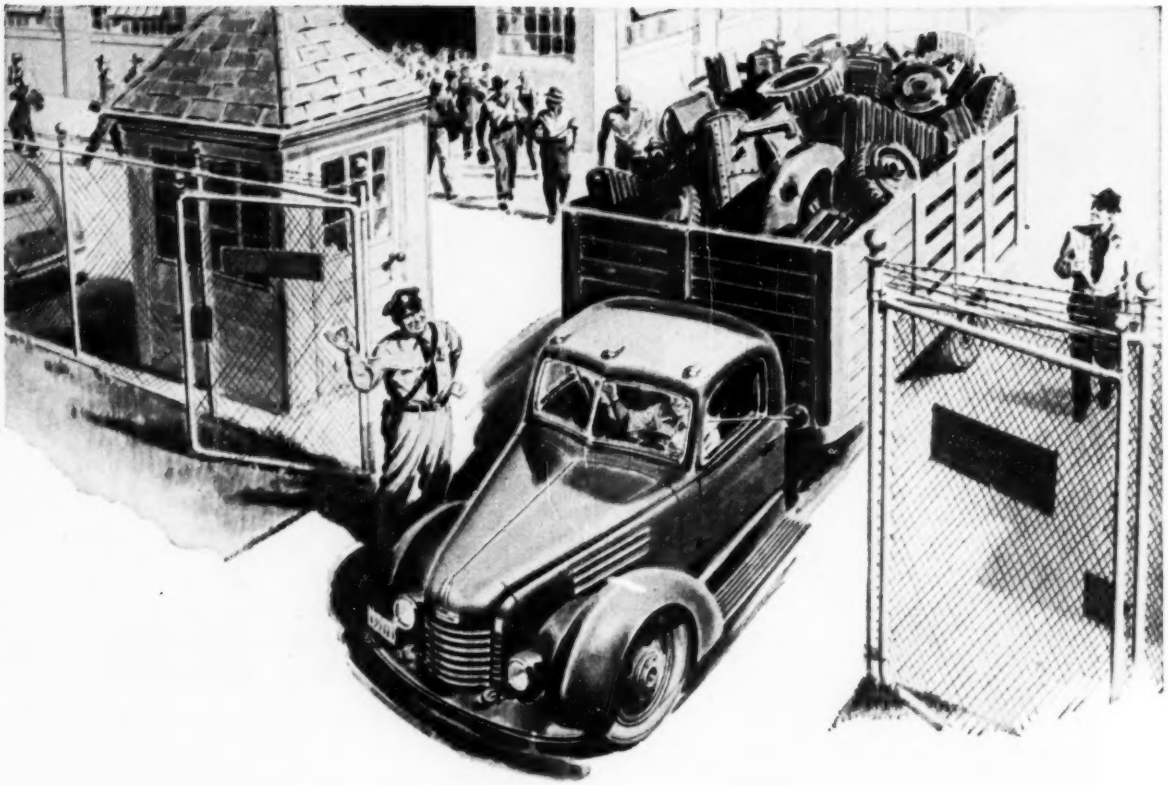
**PORUS-KROME* is a dense, hard, wear and corrosion-resistant chromium, produced by the Van der Horst Corporation of America, and which gives working surfaces an infinite number of tiny oil-retaining reservoirs for perfected lubrication.*

**VAN DER HORST CORPORATION OF AMERICA • OLEAN, N. Y.**

U. S. PATENTS 2,048,578, 2,314,604 and 2,412,698

**PORUS - KROME** VAN DER HORST

*Good for the Life of your Engines*



# Scrap's valuable!.. Scrap's precious!

**It's needed . . . badly . . . to maintain vital steel production.**
**Every plant has some—search out the iron and steel scrap in yours**

Among the *most-needed* industrial commodities, today, is *junk*.

Yes—junk iron and steel, called *scrap*.

One half of the ingredients in making new steel is *old* iron and steel—collected from the waste of metal-working and from obsolete products made of steel.

### 6,000,000 EXTRA TONS NEEDED

Today, not enough scrap is being obtained from *normal* sources to meet the demand of increased steel production.

We must get *more* scrap from other sources. One of these sources may very well be *your* place of business.

### HERE'S WHAT'S NEEDED

For help in this emergency, search your place for scrap; specifically: obsolete machinery and equipment . . . no-longer-used jigs and fixtures . . . worn-out or broken chain, wheels, pulleys, gears, pipe, etc. . . . abandoned metal structures.

If it's gathering rust or dust, it may be scrap—and more valuable being remade into steel than cluttering up your premises.

Write for booklet, "Top Management: Your Program for Emergency Scrap Recovery", addressing The Advertising Council, 25 West 45th Street, New York.

NON-FERROUS SCRAP IS NEEDED, TOO!

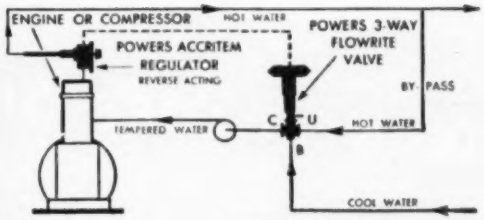
***This advertisement is a contribution, in the national interest, by***

## Diesel Power and Diesel Transportation

***Before You Buy***

# JACKET WATER TEMPERATURE CONTROL

***Investigate***

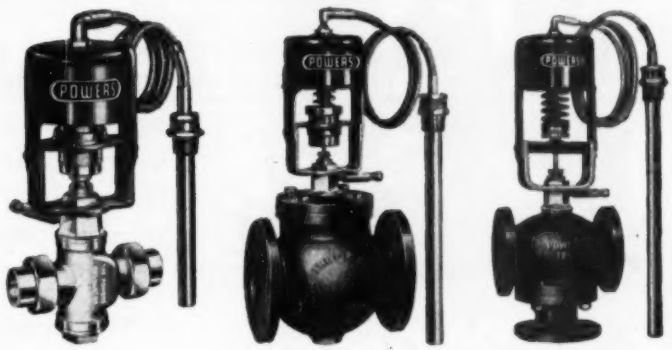


**One of Many Applications of**
**POWERS ACCRITEM REGULATOR and FLOWRITE DIAPHRAGM VALVE—**
**Compressed Air or Water Operated**

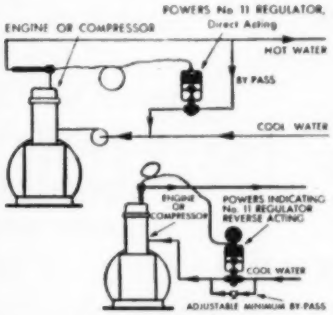
—Provides positive, dependable control for large size 3-way or 2-way valves. ***Safety feature*** of hook-up above: failure of air or water pressure allows only cooling water to flow through the valve to engine.

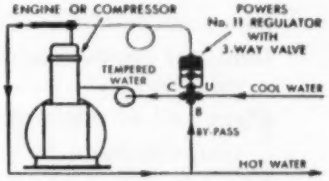
**POWERS**

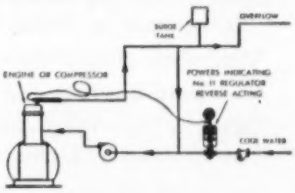
## No. 11 Self-Operating TEMPERATURE REGULATORS

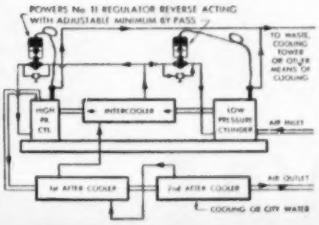


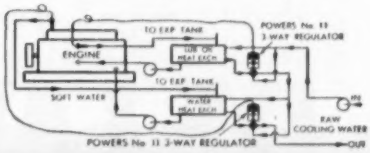
Provide dependable control for most applications. They're simple, ruggedly built, economical and easy to install. Especially suited for air compressors, diesel and gas engines. Temperature indicating regulator also available.




## Complete Line of Dependable, Time-Tested Regulators

***IMPORTANT ADVANTAGES*** that quickly pay back the cost of Powers self-operating and pneumatic controls for air compressors, diesel and gas engines:

- **Correct jacket water and lube oil temperature at all times, regardless of load or seasonal changes.**
- **Improved lubrication and cylinder liner wear.**
- **Fewer piston ring replacements.**
- **Saves Labor; increases efficiency.**
- **Reduces danger of piston seizure.**
- **Eliminates sludging.**
- **Lowers fuel and lube oil consumption.**

***Cost of Powers jacket water temperature control?*** About the same as a set of new piston rings. Powers regulators are unsurpassed for reliability and years of trouble free service.

***Have a POWERS Engineer call*** to study your requirements for better jacket water temperature control. There's no obligation. Phone or write our nearest office.

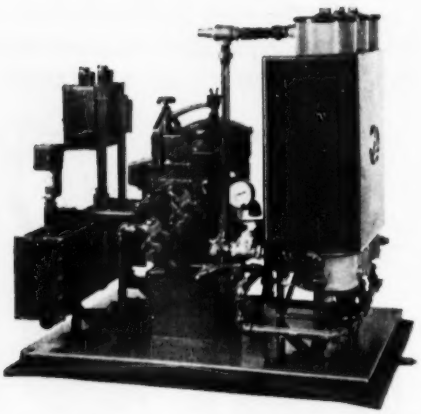
**CHICAGO 13, ILLINOIS** • 3819 N. Ashland Ave.
**NEW YORK 17, NEW YORK** • 231 East 46th Street
**LOS ANGELES 5, CALIF.** • 1808 West 8th Street
**TORONTO, ONTARIO** • 195 Spadina Avenue

*Factory and General Offices*
*3410 Oakton St., Skokie, Ill.* (DIG)

Established 1891 **THE POWERS REGULATOR CO.** OFFICES IN OVER 50 CITIES

# FOR CLEANEST LUBE OIL

# THE DE LAVAL "PURI-FILTER"



## *Note these Features*

- Removes dirt and water by centrifugal force
- Filters out harmful carbon
- Does not remove valuable additives
- Cleans oil at moderate temperature
- Speeds up inspection—crankcase is cleaner
- Minimizes ring sticking
- Increases bearing life
- Saves labor—long runs without bowl cleaning
- Increases oil life
- No dirt . . . carbon . . . or water

To remove all three major contaminants of diesel lubricating oil, use the De Laval "Puri-Filter." The first two troublemakers —dirt and water—are separated from the oil by centrifugal force. The dirt is stored against the periphery of the bowl where it can not again mix with the oil, and the water is discharged continuously to waste. The third contaminant—colloidal carbon—is filtered out of the purified oil by Fram Filters.

This combination of a De Laval "Uni-Matic" Oil Purifier and a Fram "Filcron" Filter is a completely piped-up unit that is so effective that it gets rid of all solid impurities down to approximately one micron in size. It is by all odds the most effective means ever devised for protecting diesel engine bearings.

Bulletin DL-1 gives additional details. Write for your copy.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

# DE LAVAL OIL PURIFIERS

## FOR DIESEL LUBRICATING OIL

# You can replace seamless tubing or pipe with our ROLLED STEEL SPACER TUBES OR BUSHINGS and save money in machining • material • labor

**PROMPT DELIVERY**

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FEDERAL Mogul Since 1899

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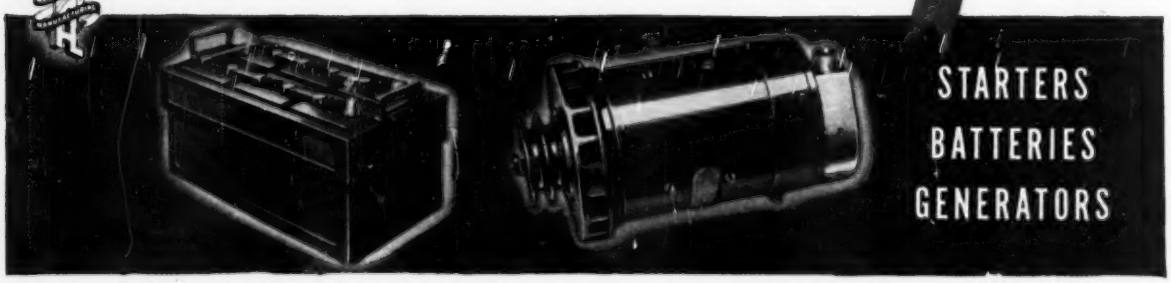

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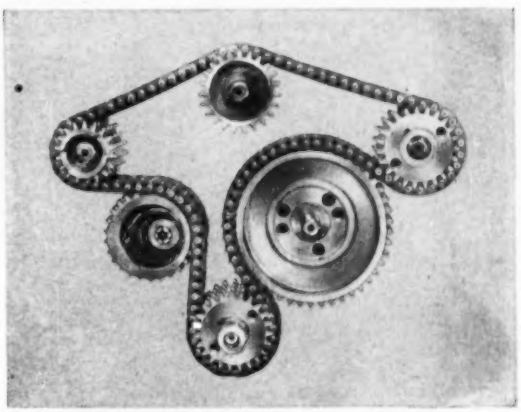
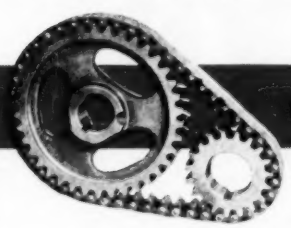


Link-Belt Duplex Timing Chain combines timing and accessory drive functions on this popular engine. Either face of the chain meshes with wheels.



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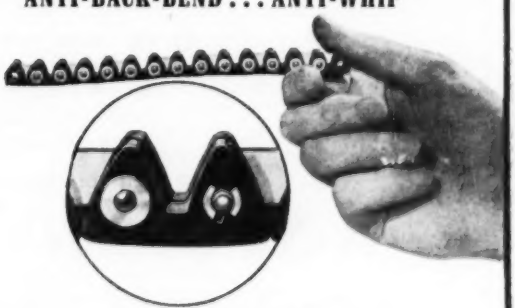

Built-in check in joint limits bushing rotation, checks backbend and whip

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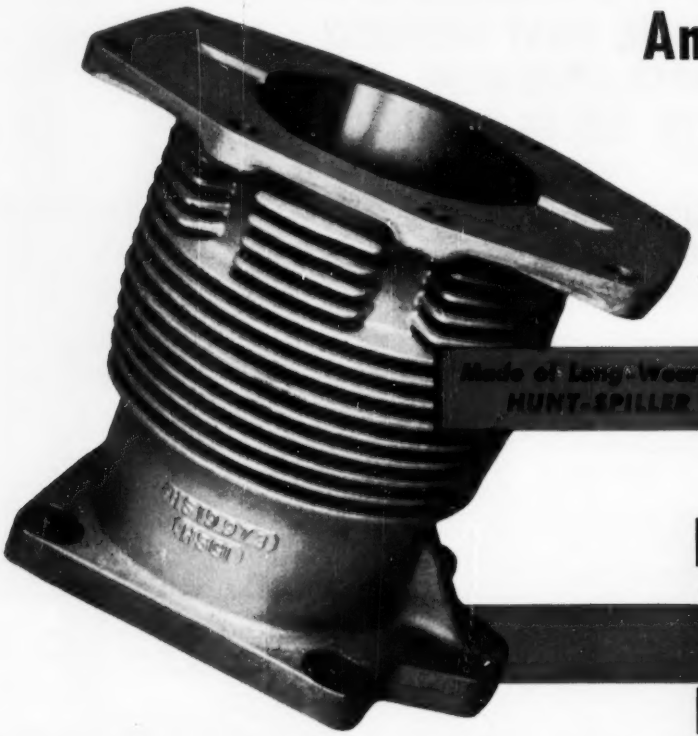

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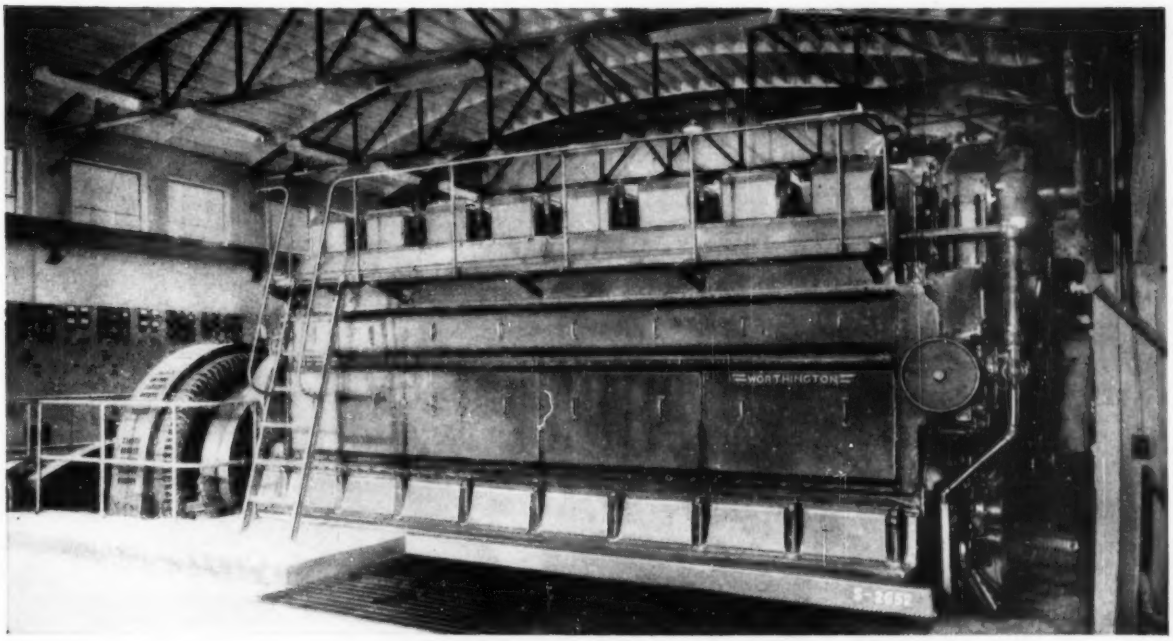
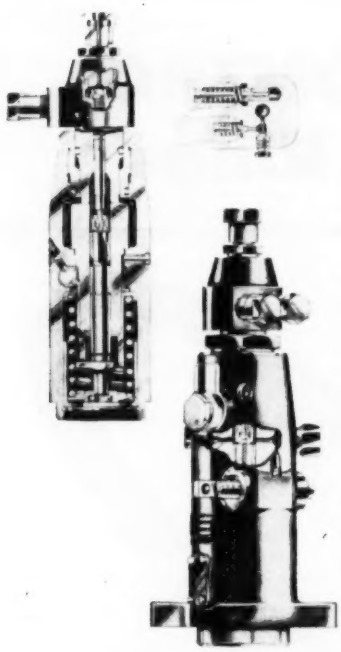



# This Diesel Is Ready

## FOR A CHANGE IN DIET



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Vol. 30 No. 1 January, 1952


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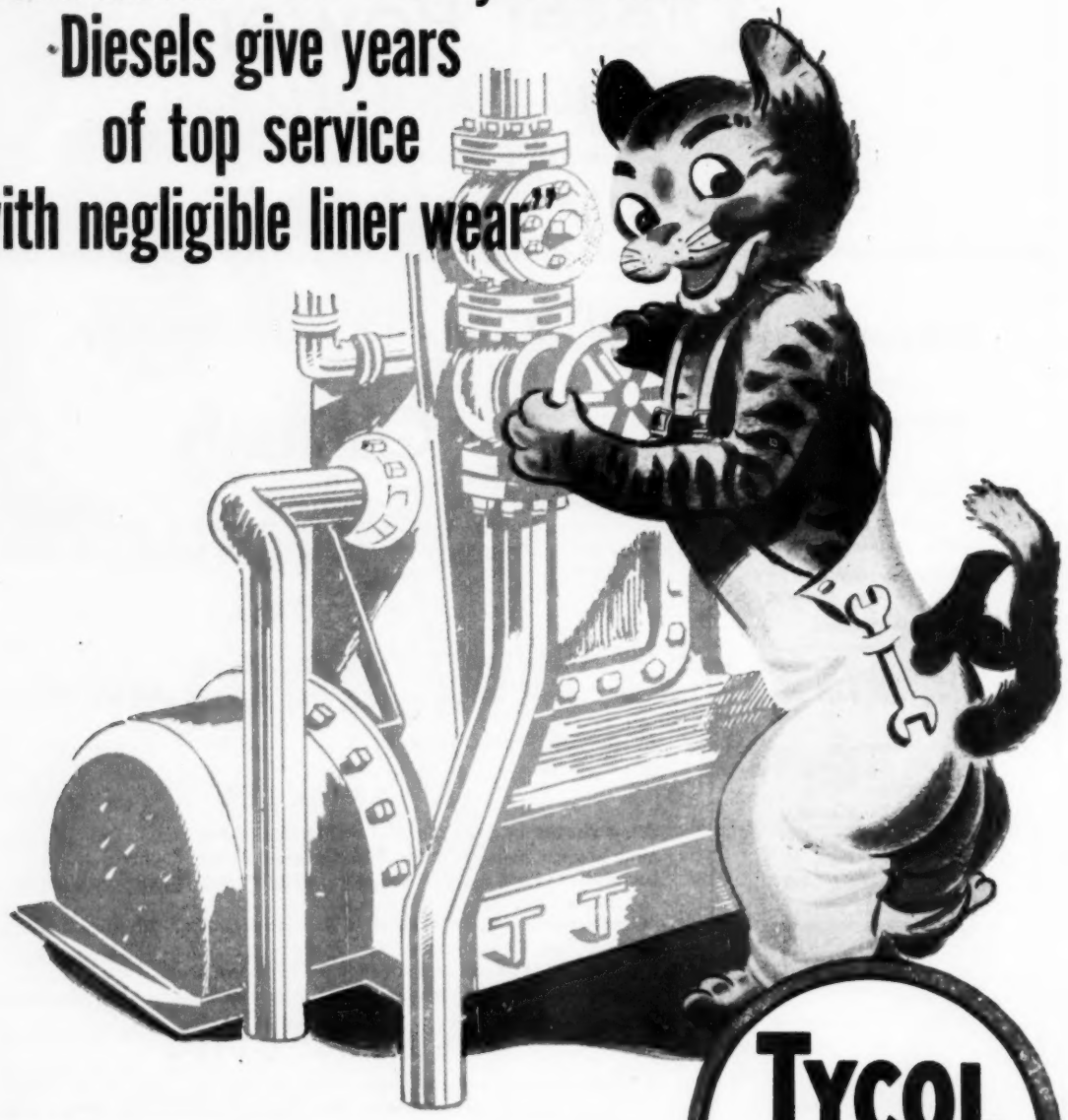

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# Why Don't They.....

Feeling very content and lazy after the good cheer of the Holiday Season, we thought that we would sort of take it easy this month and just ramble on about a number of things that came to mind. In the course of all the verbal calisthenics that generally accompany such festive occasions, one phrase was heard so frequently that it impressed itself upon what passes for our mind. It was "Why don't they . . ."

This introductory sentence has broad possibilities and may be followed by just about anything from "make nylon stockings that don't run" to simply "drop dead!" Everyone has some such questions on their mind, including ourselves. We have noted one peculiarity, however.

Somehow or other, our questions always seem particularly logical and pregnant, whereas, those of others appear to be ill-considered in view of obvious facts. Funny, isn't it? We'll have to talk to our psychiatrist about it.

Anyhow, we just thought that we would comment on some of the more popular "Why don't they's" that come to our editorial attention and perhaps throw in one of our own.

Probably the most frequently asked question concerns why diesels are not being used in automobiles. This usually comes from someone who has just filled up the tank of his car, had his tires inflated and his wallet deflated. This is the same fellow, too, that had just been asking why they didn't stop them from making more diesel-electric locomotives since they were cutting into the supply of distillates that he needed for heating his house.

This same fellow bought his car on price so as to save $50.00 and nearly drove the dealer crazy because he couldn't get the car up to 60 mph. backing out of his garage and, besides, there was a clicking valve.

So, we give him a short course on economics and a few facts. In the first place, his car would cost him more, would probably be a little noisier and not quite as flexible. Then, if diesels took over, the oil companies would lose their gasoline market and what does he think would happen to the cost of distillates? With little prospect of saving (gasoline is still a good buy) he subsides but still has his furnace on his mind.

Next, we point out that diesel-electrics have put the railroads in the best financial position that they have enjoyed in years. This, indirectly, cuts transportation costs on just about everything that he buys: Without diesels, rates would have to go up for railroads to stay in business.

Current railroad distillate usage is a very poor second to the demands of house heating. While the total number of diesel-electric locomotives rose to 12,000 in 1951, house heating was also on the increase. The API sets the figure at more than 5,700,000 at the end of the year. Granting the disparity in usage per unit, it is still far from being in line with the numerical ratio.

At this stage our friend is probably thoroughly confused—or at least more so than we are—so he retires to plan a new line of attack.

Our next "Why don't they. . . ." emanates from a source that should know better. An operator of a fleet of diesel-powered scrapers working on an unusually tough job and having some engine troubles wants to know "Why don't they field-test the engines on a 24-hr. basis at absolute maximum load factor under varied and grueling climatic and operating conditions?" In other words, make them indestructable and foolproof.

Four years of field-testing went into these particular engines and they proved adequate for all the envisioned applications. Is it logical to expect the manufacturer to over-design to suit the minority of applications and thereby penalize the majority? The amount that the manufacturer spent in self-defense to keep this equipment running is probably peanuts compared to the cost of over-designing the whole line.

It seems to us that the operator should have first realized the extremity of the task and in view of its special nature, either over-powered the equipment or made the necessary modifications.

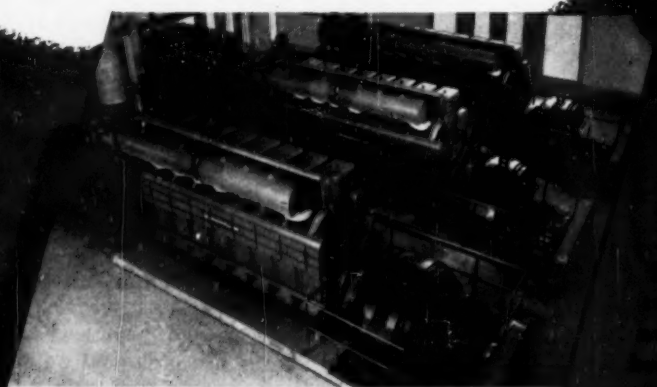
This idea of over-building recalls a story about an Englishman that was comparing the workmanship and quality of British and American padlocks. He pointed out the finer craftsmanship and the enduring features of the British locks and estimated that they had four times the life expectancy of the American product. He wound up by saying, "You people are perfectly right, you know. Long before our locks wear out, we lose the key."

There is a moral in there somewhere—we think. Told you we were going to ramble. Now for our own "Why don't they . . ." we would like to know why we can't take just a minute to wish you all

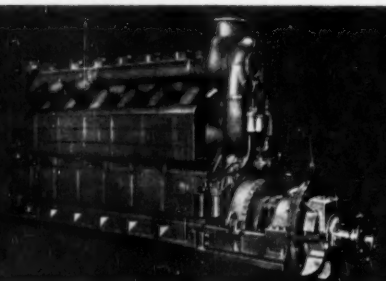
A Happy New Year

# How to DOUBLE YOUR HORSEPOWER WITHOUT INCREASING YOUR FLOOR SPACE.....

with the **NORDBERG** *Supair Thermal Engine*



Above: Three 8-cylinder Nordberg FS-138-HSC, *SUPAIR-THERMAL* 1000 kw, 450 rpm generating units at N. V. Overzeese Gas En Electriciteit Maatschappij, an electric utility in Aruba, N. W. I.



Above: Nordberg 6-cylinder FMD-136-HSC, *SUPAIRTHERMAL* engine developing 800 bhp at 300 rpm, for direct drive—direct reversing—propulsion of tugboat owned by Foss Launch and Tug Company, Tacoma, Wash.

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# + HIGHLIGHTS +

● For those of you that save your copies of DIESEL POWER AND DIESEL TRANSPORTATION, a consolidated table of contents for 1951 appears in this issue.

● Erie Railroad directors recently O. K.'ed an order for 42 diesel-electric units, which is the last large step toward complete dieselization of the road, eliminating all steam service except for short haul commuter service in the New Jersey area.

● Plans for the construction of a 780-mile natural gas pipeline by the Gulf-Michigan Transmission Co. have been postponed because of steel pipe shortage. The line was scheduled to originate in Louisiana and terminate at Michigan City, Ind.

● Baltimore and Ohio Railroad has arranged to have 55 new freight diesel-electric units built. They will cost $9,559,035 and will be the property of Equitable Life Assurance Society, to be leased to B. & O. for a 15 year period.

● Boston & Maine Railroad has placed orders for 39 diesel-electric locomotives. Costing $5,000,000, 23 of the units will be built by Alco and 16 by Electro-Motive. With the delivery of the new engines, the road will have 233 diesel-electric units in service.

● There is petroleum to be found in Brazil—at least so says the National Petroleum Council of that country. The council has asked President Vargas for authorization to launch a loan for $540,000,000 to further research and exploitation of petroleum resources by a company to be formed for that sum.

● The Atlantic Coast Line Railroad called a meeting of stockholders Jan. 15, to approve the acquisition of the Florida East Coast Railway's properties.

● Several steel companies are now reported to have plans for building ten new blast furnaces for the production of pig iron. They are being considered because of the indicated long-term scarcity of scrap metal.

● RFC recently approved a $1,000,000 loan for the Davenport Besler Corp. so that the company can process its growing backlog of growing orders of diesel and steam locomotives.

● General Motors Corp. recently dug up an extra 10,432 tons of nonproduction scrap from its own plants, suppliers, and dealers to help the scrap drive along. This is in addition to the 100,000 tons regularly returned monthly to steel mills from manufacturing operations.

● Caterpillar Tractor Co. announced recently a $35,000,000 expansion plan made necessary by growing demands. A new factory is to be built on a 180 acre site at York, Pa. and extensive additions will be made to the present plant at Joliet, Ill.

● Anaconda Copper Mining Co. now has the go-ahead signal from the government to start large scale production of aluminum. Overriding objections of both the Departments of the Interior and Justice, Manly Fleischmann, Director of the Defense Production Administration, took the position that Anaconda's entry would provide more competition in aluminum production than exists at present.

● An unusual municipal power plant is shaping up at Zeeland, Michigan. There will be conventional in-line diesels, a Fairbanks-Morse O-P, and now a Nordberg radial engine.

● Due to the increasing use of oil in meeting the nation's energy requirements, Standard Oil Company of California recently announced that they had spent over $113,000,000 for oil exploration work both here and abroad.

● Despite some improvement in recent allocations, sufficient steel will not be available for all oil pipeline and storage projects in the first or even the second quarter of 1952.

● Synthetic lubricants have now been developed for lubricating gas turbine aircraft engines. This is the first significant application of these oils, which have been developed by the combined efforts of the Navy, Air Force, and the chemical and oil industry.

● At a recent Public Service Commission hearing into the dropping of two passenger trains by the New York Central between Weehawken, N. J. and Albany, N. Y., the railroad presented testimony showing that increased use of autos and buses were responsible for the great decline of rail passenger traffic in the area.

● An order for 149 diesel-electric units for delivery in the first half of 1952, has been placed by the Chesapeake and Ohio Railroad. The order which amounts to about $22,000,000 will be filled by Electro-Motive, Alco, and Baldwin-Lima-Hamilton Corp. It is understood that most of the new units will be placed in freight service.

# Diesel Engine Prospects

by Peter B. B. Andrews
*Economist, Future Sales Ratings*

## *The Prospect*

A PERIOD of heavy demand is ahead for the diesel engine industry in 1952, but its satisfaction is tempered by the availability of materials for manufacturers.

Nevertheless, on the consensus of high basic essentiality of the diesel engine industry and the production materials likely to be obtained by diesel engine manufacturers, the writer and his 300-man board of future-sales-ratings associates have assigned one of the top prospect ratings (five stars) for diesel engines in 1952.

### ★ ★ ★ ★ ★ Diesels Rated a Necessity

The diesel industry's importance is particularly limelighted in the present military economy where efficient and economical operation such as provided by diesel power is a necessity for attainment of the nation's objectives. Diesel power is now creating a great impetus to such fundamental industries as railroads, construction, shipping, trucking, bus transportation, farming, petroleum production, construction, logging, mining, basic industrial power, quarrying, irrigation, and municipal utilities.

It is true that the Government has made some raw material allocation cutbacks for diesels, but this is considered by the Board a temporary situation, with any future program reductions likely to be moderate and considerably smaller than for the majority of durable goods lines.

On the basis, in fact, of likely material allocations and the stretching and substitution of materials, as well as the additions possible through appeals in view of the industry's importance to the defense program, the Board feels that most fields of diesel engine usage can be sold more diesel engines in 1952 than in the year 1951. Diesels are considered the most economical major source of power that the United States possesses today.

### ★ ★ ★ ★ ★ Projected Diesel Purchases in 1952

Projecting the demand for diesel power into 1952 shows the equivalent or an increase as against 1951 in all of the various categories of diesel usage. In most cases where there is no increase projected it does not necessarily reflect the actual demand but the production ceiling established by materials allocations.

Actual figures are shown in the tables accompanying this survey so the following comments will be restricted to supporting and amplifying data in some categories.

### *About the Author*

A former editor and marketing economist of Standard Statistics Company and The Wall Street Journal, Dr. Peter B. B. Andrews also conducted for "Sales Management", over the last 16 years, the "Future Sales Ratings" surveys for the 100 leading industries of the country. A forecast record of 86 per cent accuracy was later determined by events.

Dr. Andrews was called to Washington by W. P. B. Director Gen. William S. Knudsen in 1941 and served as Industrial Economic Adviser throughout the four years of the war. He has done marketing studies for some of the country's largest enterprises, and in the past 20 years has written business and marketing articles for 27 of the leading magazines of the country.

Currently he is standby economic adviser to several U. S Government agencies, and is editor of "Future Sales Ratings" as well as being consulting economist to "Sales Management".

*Transportation*—In railroad transportation, dieselization is progressing rapidly, with prospects of acceleration in the armament economy. The economy and efficiency aspects of diesels have won over the railroad industry; thus, total locomotive production for the first quarter of 1952 is scheduled at 750, and only 15 of these are steam units.

Over half the nation's freight tonnage and passenger traffic now rolls behind the efficient 19,000 diesel units on American railroads. By contrast, at the beginning of World War II only 2 per cent of the freight tonnage and 9 per cent of the passenger traffic were hauled by diesels.

In the field of shipping, a record high diesel production and demand for 1952 is forseen by the Board.

Other vital segments of the transportation field likewise are seen as taking advantage of dieselization to cut higher costs. Diesels for truck and bus operation are rapidly coming to the fore. Truck and bus fleets have been growing in the country; the Board now estimates approximately 30,000 fleets of eight or more trucks or buses.

The transportation industry itself is seen as in a great period growth. Transportation and related facilities, in fact, comprise the second largest group in the certified expansion program of the Government—second only to the basic materials-producing classification. Cost of facilities approved in the transportation and storage facilities group now exceeds $1,400,000,000, of which over a billion dollars is allowed for rapid amortization. Total plant and equipment expenditures of the transportation industry are estimated at $2,140,000,000 for the full year 1951, compared with $1,680,000,000 for 1950.

*Agriculture*—The high merits of diesel power for use in agriculture likewise has been recognized and that huge industry is steadily increasing its dieselization. About 70,000 diesel engines, including those sold in tractors, power plants and general agricultural uses, are expected to be sold in 1952.

Citing one application, diesels are finding an increasing demand in irrigation pumping. While competing with other forms of power, diesels are becoming more popular where pumping operations involve 600 or more hours a year, at which point they become the most economical.

*Petroleum*—Equally vital is the giant petroleum industry, which has assumed an even greater essentiality, if possible, with the cutting off of some foreign supplies. The Board estimates about 3700 diesel engines may be made for the petroleum industry in 1952.

*Mining*—Also of high essentiality is the mining industry —indicating in another instance how diesels cut across the broad field of essentiality. For increased activity in the nation's production and processing of scarce mineral ores, the mining industry will need more diesels in 1952.

Plant and equipment expenditures for the industry have been increasing substantially. For 1951 it is estimated that about $890,000 has been thus scheduled, or 30 per cent over the $680,000,000 scheduled for 1950.

### ★ ★ ★ ★ ★ Adequate Fuel Oil Estimated

The Board recognizes the bad state of the oil import situation and prospects, but anticipates adequate fuel oil unless extraordinary and unforeseeable conditions develop. It is indicated that dealers and jobbers of oil products have been active last summer building up their storage of fuel oils, and primary stocks of fuel oils are expected to build up more sharply in the near future as major oil refiners work to boost their own supplies in anticipation of high winter demand.

Crude oil production is expected to stay up close to or above record levels. This is considered necessary to keep needed refinery output at its high level and at least maintain stocks of crude oil.

# The Reasoning

PRECEDING estimates of the potential market for diesel engines in various fields are contingent on a variety of factors to be analyzed in subsequent paragraphs. So that the reasoning of this Board in assigning the diesel engine industry a top, five-star rating could be obtained, DIESEL POWER & DIESEL TRANSPORTATION asked the writer for a study explaining why the situation was so viewed .

Preceding data indicate some of the Board's thinking; actually, the indispensable nature of the diesel engine in promoting the armament program and in essential civilian uses is the common denominator of this reasoning. It is felt that materials for increased diesel output will be available whether it be eventually by actual allotment, by appeals based on essentiality, by effective use of some substitute materials, or by a combination of these factors. Other pertinent factors will also be discussed.

## PETROLEUM

**"With the threatened cut in foreign supplies, our vast petroleum industry will be assuming even greater importance in 1952. Here again, we find a wide variation in size and type of engines, with large heavy-duty diesels powering more and more pipeline pumping stations while smaller high speed engines are employed in many drilling operations. As a whole, the petroleum industry will probably take about 3,700 diesels in 1952."**

**The Board's estimate for 1952 compares with recent years as follows:**

| Year | Engines |
|---|---|
| 1952 | 3,700 |
| 1951 | 3,600 |
| 1950 | 3,546 |
| 1949 | 3,197 |
| 1948 | 3,184 |

### ★ ★ ★ ★ ★ Materials Availability Factors

*Rearmament Program*—Assuming no major world war, the Board feels that the national defense program and overseas-help program will move along more slowly than now preliminarily projected, relieving the heavy drain on raw materials. Consensus is no world war in the foreseeable future. Russia is considered to have gone well past its strategic timing; and by next spring we will be vastly stronger and more obviously an unconquerable opponent.

Important technical improvements are considered to be in the offing, and desire not to be burdened with obsolescent materiel is becoming a planning factor now. Therefore, the Board feels that no great acceleration of the general armament program is ahead—barring World War III.

It is recognized that we must be prepared, of course, for Russia's continued strategy of kicking up sporadic troubles in various parts of the world, and there is no indication of an immediate slowing down of the armament program. The Board's high essentiality rating for the diesel engine industry stamps it as one which should get adequate raw materials for production, even in a greater armament economy than now exists.

Armament is steadily embracing a larger proportion of the raw materials supply. A year ago arms were taking about 5 per cent of the available steel, now they are taking about 11 per cent and will reach about 14 per cent in 1952. Consensus of the Board is that the military "take" will fall well short of the 20 per cent of total steel indicated by some forecasters as likely. Foreign steel imports are helping, too, and in most instances this imported steel is usable on top of quotas of domestic steel granted by Government operating authorities.

The bite on copper is greater percentagewise; a year ago armament was taking about 9 per cent, now it is taking about 17 per cent and may reach about 24 per cent in 1952. The aluminum figure is still larger. It was about 20 per cent a year ago, now it's about 25 per cent and it is expected to top 30 per cent in 1952, in which year, however, there may be some relief from new capacity.

## CONSTRUCTION

**"One of the biggest outlets for diesel engines in recent years has been the construction industry. Although there have been thousands and thousands of diesel dozers built, the Board sees a steady demand for even more in 1952. The same applies to all types of construction equipment, including earth-moving rigs, power shovels and mobile cranes. Production should hit about 29,000 engines for off-highway equipment next year.**

**Including 1952, the Board shows more than 136,000 diesel engines produced for the construction industry in a five year period. The annual breakdowns are:**

| Year | Engines |
|---|---|
| 1952 | 29,000 |
| 1951 | 28,583 |
| 1950 | 27,468 |
| 1949 | 26,342 |
| 1948 | 24,877 |

There are currently not enough materials to go around, but some members of the Board attribute this to maldistribution of these materials at present and the overstatement of requirements, which are expected to be much smaller for many, in the final result, than recently shown.

*Many Requirements Exaggerated*—Anxiety not to be caught short has motivated much of the placement of high requirements; consensus of the Board now indicates there will be a crackdown on those padding and duplicating requirements and stocking excess inventories or gray market materials. Also likely to unloosen large amounts of raw materials is the coming heavy campaign on compliance to the letter on all Government regulations.

Recently the National Production Authority established an administrative court to hear cases of alleged violations wherein the respondent has used materials or facilities in a manner prohibited by N.P.A. orders or regulations, made a misprepresentation with regard to the allocation of materials, or violated N.P.A. order or regulations in any way.

Another factor creating temporary shortages is that huge inventories of raw materials have gone into end products. The majority of the Board feels that the rate of consumer durable goods output in the fiscal year 1950-51 was far beyond anything that the U. S. economy could possibly absorb. Anticipatory buying of the post-Korea outbreak was borrowed from the future extending even to 1954.

Some of this high production was made from large inventories but, even so, it is considered significant that now, with the huge consumer durable goods industry producing about half of what it did at the peak rate of the post-Korea period, an ultimate relative betterment in raw material availability must ensue. Meanwhile, capacity and output of critical materials generally are on the rise.

*Materials Capacity Increasing*—Output increases are fast being made, especially in steel and aluminum. The pre-Korean production capacity of steel was under 100,000,000 ton annually. Objective expansion is 118,000,000 ton; we already have 8,000,000 ton of that added capacity and are moving ahead rapidly. Aluminum capacity is expanding, too, and eventually will almost double—to about 1,400,000 ton a year from the pre-Korea 750,000-ton total.

Meanwhile, we are importing almost three times as much iron ore as we imported before World War II; 50 per cent more copper, ten times as much lead, eight times as much zinc, five times as much bauxite and twelve times as much aluminum. The Government recently has exempted from price control a number of industrial import ores and materials having strategic importance to the defense program. Moreover, in one recent month the Government signed 35 new mineral project contracts in 14 states to boost future supplies.

*Production Ingenuity Asserts Itself*—This is not to imply that the Board anticipates overnight improvement in the raw materials situation. It is still considered tight but in a state of maldistribution, with vast improvement on the horizon as the typically keen American production ingenuity asserts itself.

In any case, given even the *status quo*, it is believed that much can be accomplished in stretching the materials allocated—again with the ingenuity which typifies the efficient diesel engine manufacturer. Redesigning equipment and using substitutes for copper, steel, aluminum and other metals in short supply is increasingly being done.

## ★ ★ ★ ★ ★ Appeals Route To More Materials

Another way in which the diesel engine industry is viewed by the Board as being able to improve its production is by way of getting more materials through appeals. That is an avenue which might not apply to the majority

## GENERAL INDUSTRY

**"In the generation of power in general industrial applications, diesels range all the way from the giants found in aluminum reduction plants to small emergency stand-by units. Because of the tremendous building in heavy defense industries, the Board predicts an extremely brisk market for diesel engines in the general industry classification."**

**This upward trend is indicated in the following group of Dr. Andrews' production statistics:**

| Year | Engines |
|---|---|
| 1952 | 13,700 |
| 1951 | 13,146 |
| 1950 | 12,378 |
| 1949 | 11,131 |
| 1948 | 11,763 |

## AGRICULTURE

**"Agriculture likewise has recognized the high merits of diesel power and that sprawling industry is steadily increasing its dieselization. Irrigation pumping has become a considerable market for diesels, and when added to the demand for diesel tractors, small power plants and general farm use, it brings the number of agricultural diesels required for 1952 up to about 70,000."**

**According to these statistics, roughly 50% of each year's diesel production goes into agricultural uses.**

| Year | Engines |
|---|---|
| 1952 | 70,000 |
| 1951 | 70,000 |
| 1950 | 70,063 |
| 1949 | 66,825 |
| 1948 | 64,799 |

of industries, but diesel is seen as rating high essentiality because of the country's present need for great industrial efficiency and labor-saving.

Thus, since the criterion of additional allotments of critical materials is whether or not the denial will adversely affect public health, safety or welfare, the argument in favor of diesel power appears strong. The Board believes that railroads, trucking, passenger transportation, farming, construction, shipping, mining, petroleum production, logging, road building, basic industrial power, irrigation, quarrying, and municipal plants are all vital under this criteria and are moving toward greater efficiency through dieselization.

## MINING

"Also of high essentiality is the mining industry--indicating in another instance how the diesel engine cuts across the broad field of essentiality. For increased activity in the nation's production and processing of scarce mineral ores, the mining industry will need more diesels in 1952. The Board estimates the mining and quarrying potential take at 2,400 diesels."

The Board's production record clearly shows the increased use of diesels in mining operations.

| Year | Engines |
|---|---|
| 1952 | 2,400 |
| 1951 | 2,325 |
| 1950 | 2,317 |
| 1949 | 1,986 |
| 1948 | 1,913 |

## HIGHWAY TRANSPORTATION

"Other vital segments of the transportation field likewise are seen by the Board as taking advantage of dieselization to cut high operating costs. An estimated total of 8,800 diesel engines for trucks are expected to be produced in 1952, while the potential output of diesel bus engines is estimated at 7,900."

The Board gives the following breakdown for 1952 and recent years:

| Year | Truck | Bus | Total |
|---|---|---|---|
| 1952 | 8,800 | 7,900 | 16,700 |
| 1951 | 8,700 | 7,550 | 16,250 |
| 1950 | 8,678 | 7,361 | 16,039 |
| 1949 | 8,363 | 7,089 | 15,452 |
| 1948 | 8,197 | 6,997 | 15,194 |

### ★ ★ ★ ★ ★ Prospective Labor Picture

Actual armament production gets the top essentiality call for skilled labor, and there could well be some weaning away of such labor from the diesel engine producers, even though most of these companies also have some military contracts.

Despite some layoffs as a result of consumer durable goods production cuts, the general employment situation has not eased. One indication of the extent to which the nation has dipped into its pool of unemployment during the high economic activity of 1951 is the sharp drop in unemployment rates for workers in the heavy industry occupation groups. Unemployment rates for skilled craftsmen have fallen from 6.9 per cent last year to 2.2 per cent now; for semi-skilled workers from 7.8 per cent to 4.2 per cent, and for the unskilled from 14.3 per cent to 4.8 per cent.

While most members of the Board expect the labor situation to become tighter soon, some are confident that the labor supply will be ample for the high production contemplated under the Wilson Plan. That plan calls for industrial expansion to the point where national production will be able to provide for both civilian and defense needs.

The diesel engine manufacturers are considered to be in a better position than the average heavy industry since they can more logically absorb workers from the declining automotive and related consumers durable goods divisions. Competition for competent workers, however, is expected by the Board to be keen, and an ample supply of labor for diesel engine manufacturers is by no means assured.

## RAILROADING

"In railroad transportation dieselization is progressing rapidly, with prospects of acceleration in the armament economy. At least as many diesel-electric locomotive units will be installed in 1952 as in 1951, and the final year's figure should be about 3,200.

The economy and efficiency aspects of diesels have won over the railroad industry; thus total locomotive production for the first quarter of 1952 is scheduled at 750, and only 15 of these are steam."

According to Dr. Andrews' figures, production of diesel-electric locomotive units in 1952 will compare with that of previous years as follows:

| Year | Total Units |
|---|---|
| 1952 | 3,200 |
| 1951 | 3,200 |
| 1950 | 3,174 |
| 1949 | 2,755 |
| 1948 | 2,299 |

★ ★ ★ ★ ★ **Purchasing Power Prospects Favorable**

All things considered, the Board foresees a substantial output of diesel engines in 1952. Question then arises as to the ability and willingness of the market to buy this equipment. There is little doubt as to the ability to buy. Financial condition of American business has never been stronger. The current net working capital position (current assets in excess of current liabilities) approximates $80,000,000,000—being about three times that of pre-World War II days. Moreover, not only has lending at attractive rates been easy but, reflecting the bull market in stocks and bonds, sales of new corporate securities have recently been at record highs.

Some railroads are in the best financial condition of their entire history; in fact, they have been aided considerably in most instances toward strengthening financial conditions of recent years because of their large investments in diesel power. Financial conditions of railroads has improved about 40 per cent in recent years.

Motor truck and bus transportation, too, on the whole, has improved its working capital position. Working capital is estimated to be up in this field about 130 per cent, since the end of World War II. Similarly, the entire gamut of industries served by diesel power and previously detailed has registered a sharp improvement in financial conditions and therefore in ability to buy.

★ ★ ★ ★ ★

AND IN CONCLUSION these are the facts, figures and estimates of the Board of Analysts of Future Sales Ratings that represent the framework of thinking which has brought a top, five-star rating for the diesel engine industry in 1952.

## MARINE

"In the field of shipping, a record high peacetime diesel production and demand is foreseen by the Board. Consensus of estimate is 117 diesel-propelled vessels measuring over 100 gross tons each for 1952. A substantial rise over 1951, in which the first eight months produced 47 straight diesel-propelled vessels over 100 gross tons and three with diesel-electric drive.

There will also be a gain in the number of diesels being installed in vessels of less than 100 gross tons, with a total of 2,350 diesel engines projected for this type of marine service in 1952."

Here is the Board's marine projection, together with production figures for recent years.

| Year | Vessels Over 100 Gross Tons | Diesel Engines for smaller vessels |
|---|---|---|
| 1952 | 117 | 2,350 |
| 1951 | 81 | 2,162 |
| 1950 | 77 | 1,869 |
| 1949 | 89 | 1,467 |
| 1948 | 102 | 1,194 |

## MUNICIPAL and UTILITY

"The Board estimates that central and municipal power plants will want a minimum of 500 diesel engines in the year 1952. Though the figure is small, considerable horse-power is involved and the outlook is far more encouraging than it has been for the immediately preceding years."

The Board's utility figures show this interesting improvement:

| Year | Installations |
|---|---|
| 1952 | 500 |
| 1951 | 450 |
| 1950 | 436 |
| 1949 | 307 |
| 1948 | 280 |

| | 1952 Projected | 1951 | 1950 | 1949 | 1948 |
|---|---|---|---|---|---|
| Railroading | 3,200 | 3,200 | 3,174 | 2,755 | 2,299 |
| Highway Transportation | 16,700 | 16,250 | 16,039 | 15,452 | 15,194 |
| Marine | 2,467 | 2,243 | 1,946 | 1,556 | 1,296 |
| Municipal | 500 | 450 | 436 | 307 | 280 |
| General Industry | 13,700 | 13,146 | 12,378 | 11,131 | 11,763 |
| Petroleum | 3,700 | 3,600 | 3,546 | 3,197 | 3,184 |
| Mining | 2,400 | 2,325 | 2,317 | 1,986 | 1,913 |
| Construction | 29,000 | 28,583 | 27,468 | 26,342 | 24,877 |
| Agriculture | 70,000 | 70,000 | 70,063 | 66,825 | 64,799 |
| | 141,667 | 139,797 | 137,367 | 129,551 | 125,605 |

## *Some Factors in Accessory Equipment Selection as Applied to . . . . . .*

# Cooling Equipment

*Some months ago, we brought you "Grass Roots Report", selected abstracts from the General Technical Committee Meeting of the Oil and Gas Power Division, ASME. Here are some more from a more recent Meeting. This time, the down-to-earth comments of men well known in the industry were such that they permit correlation by subjects under the general heading of "Selection of Accessory Equipment". This is the first and there will be more on other topics.—Ed.*

### Some Cooling Equipment Criteria and Planning

as outlined by MR. RAUSHENBERGER, REA: Our specifications for the auxiliaries, which include the cooling-water system, are based upon operational requirements at the particular locality. Specifications for the water-cooling system which relate to the temperature differentials of the jacket water and lube oil, and the rate and control of the flows, are written to permit the engine manufacturer to use what he deems best for his installation.

Specifications related to the method and type of cooler to be used is based upon facts known about the plant site, such as elevation, ambient temperature, wet-bulb temperature, source, quantity, and quality of cooling water. The number of units to be installed and their rated capacities are considered in determining the type of cooler to be used.

In viewing the present trends of construction by REA borrowers, it may be generally said that engine-generator units of ratings up to about 500 hp. are usually cooled by radiators. About 60 per cent of the units between 500 and 1600 hp. are radiator-cooled, 30 per cent use cooling towers and 10 per cent use heat exchangers. The latter are in plants located near rivers and lakes. Units between 1600 and 3700 hp. are usually cooled by cooling towers or heat exchangers.

In comparing installations of similar units and cooling systems, we find each plant has problems peculiar to itself. Some problems arise from operating in localities having freezing or sub-zero temperatures, others from difficulties in maintaining adequate and proper treatment of cooling water and training "old-time" operators to operate the modern-design engine-generators at the higher jacket-water and lube-oil temperatures.

Our experiences have proven most successful when we permitted the engine manufacturer to design the installation of the auxiliaries in accordance with operational characteristics specified by the consulting engineer. The design is approved by both the consulting engineer and the engineers of REA prior to construction.

It has been noted that the design engineer usually quotes estimates with conservative allowance for rate of heat dissipation for the design of the cooling equipment for the engine. The designer of the heat exchangers places a conservative rating on the ability of the exchanger to transfer heat. The supplier of the cooler, which is to dissipate the heat, usually recommends the next larger size. The prudent consulting engineer in his specifications requires the design to include a 10 or 15 per cent fouling factor. Under these conditions the cooling system proves to be adequate for the installation.

However, in the eyes of the operating personnel a cooling system cannot be over-designed for capacity. Sometimes they complain that the cooling system has not been adequately designed. Usually these cases prove to be instances where improper maintenance has allowed excessive scale to accumulate, or of improper operation of a system which is expected to cool jacket water to 120° F when it was designed for 160° F.

Following up this thought—

### Selection of Properly Sized Coolers or Radiators

was discussed by MR. A. D. BOGUS, YOUNG RADIATOR COMPANY: A discussion of selection of a properly sized cooler or radiator can perhaps be best illustrated by an analysis of the formula:

$$\text{Surface Area} = \frac{\text{Heat Load}}{(\text{Temp. Differential})\ (\text{K Factor})}$$

*Where: Surface Area is in sq ft; Heat Load in Btu/hr; Temp. Diff. in °F is spread between average water and entering air; and K Factor (heat transfer coefficient) in Btu/hr/sq ft/temp. diff.*

To further illustrate this equation let us consider the initial cost of a water-cooling radiator, the surface area required and fan horsepower consumed in handling the cooling requirements of a typical supercharged diesel

engine under varying temperatures and safety factors. The radiator would cool jacket water from a maximum temperature through a 30° F drop, making use of a shell-and-tube cooler for oil cooling.

*Engine Data:* 1500-hp. supercharged engine
Total heat load (jacket water & lube oil) is 3,820,000 Btu/hr
Ambient air = 100° F
Altitude = 1000 ft

*Condition A:* With 160° F maximum water temperature and 100% load, find cost, area and fan hp.

*Condition B:* With 150° F maximum water temperature and 100% load, find cost, area and fan hp.

*Condition C:* 160° F water and 110% load; find cost, area and fan hp.
150° F water and 110% load; find cost, area and fan hp.

*Condition D:* 160° F water and 120% load; find cost, area and fan hp.
150° F water and 120% load; find cost, area and fan hp.

*"Well, I finally got a cooling system that's big enough!"*

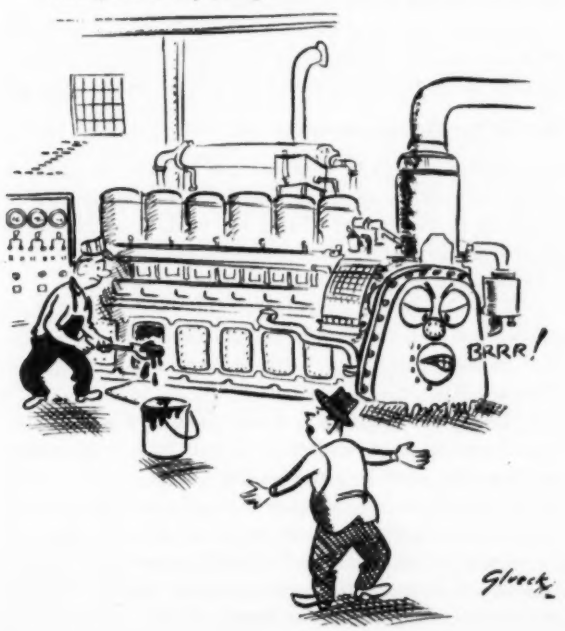
CONDITION A

The corresponding surface area for the radiator is determined as follows:

$$\text{Surface Area} = \frac{3{,}820{,}000}{\frac{160+130}{2} - 100\ (565)} = 150 \text{ sq ft}$$

A 15-hp., 2-speed motor would be recommended.
Cost of radiator with motor, starter and V-Belt drives would be approximately .....$5,640.00

*"Are you making power or sludge? Let's keep those temperatures up where they belong!"*




CONDITION B

Would require a radiator of approximately 200 sq. ft. with a 20-hp. motor at a total cost representing an increase in price of 32% over Condition A .....$7,465.00

CONDITION C

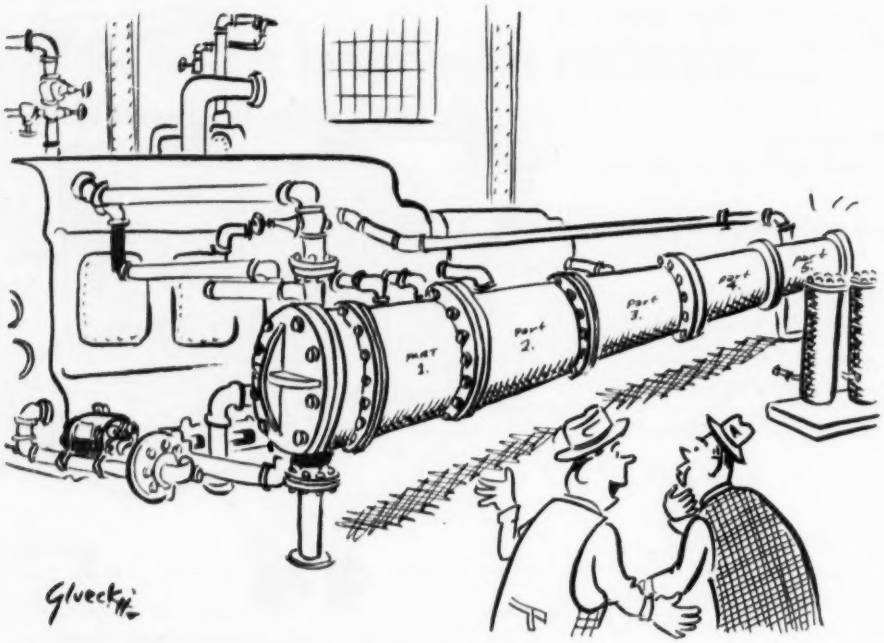
With 160° F water and 110% load, the requirements now become 150 sq. ft. surface area, 25 hp. for fan and a cost approximately 6% over Condition A .....$5,970.00
With 150° F water and 110% load, area needed is 200 sq. ft.; motor hp. must be 30. Cost is .....$7,740.00

CONDITION D

For 160° F water and 120% load, a cooler of 165 sq. ft. using a 25-hp. fan is needed. Total cost is an increase of 12½% over Condition A..$6,475.00
For 150° F water and 120% load, approximately 220 sq. ft. is required with 25 fan hp. Cost is about 43% over Condition A .....$8,040.00

It is always a good idea to have some reserve in the cooling system to compensate for unusual changes in engine load and temperature beyond the design conditions. Many times, however, the safety factors included in engine heat loads by the manufacturer are not known to the radiator manufacturer, so he arbitrarily adds his own factors of safety ranging between 5 and 10 per cent. This addition of factors, in many instances, may make the cost of the cooler considerably higher than actual operating conditions of the engine warrant.

For further consideration, an allowable increase in the maximum water temperature under additional engine loads may reduce the cost of a cooler. For instance, the radiator in Condition A, normally handling 100 per cent load




*"Yeah! The engine builder wanted the first part; the consulting engineer the next; then the cooler people tacked on some for 'fouling factor'; next, the salesman was good; and I wanted the rest to be sure!"*

and 160° F maximum water will take care of 110 per cent load with an increase of only 5° F in the water temperature. At 120 per cent load, under the same conditions, the increase in temperature is 10° F, or to 170° F.

In addition, from an economy standpoint a compromise must be made between the magnitude of the radiator surface area and the permissible fan loads. A high fan load becomes a constant parasitic drain on the auxiliary electric-power source, especially if more than one radiator or fan is involved.

Two solutions are available under conditions of high fan load; use of multiple-speed motors or use of more radiator surface area. Two-speed motors are recommended for use on fans requiring more than 15 hp., since the fans normally operate at half speed more than 75 per cent of the time and consume approximately 1/6 of the power required at full speed. Likewise, the additional cost of a larger radiator with consequently lower fan load may be offset by power savings over the period of a year or two.

To summarize, high operating temperatures for the engine reduce the size of radiator, lower the fan loads and greatly reduce the price of the cooling system.

In discussion, a point was raised regarding—

## Need for More Specific Data

and was brought up by LEE SCHNEITTER, EBASCO SERVICES, INC.: Mr. Raushenberger and Mr. Bogus have spoken about picking cooling equipment. Of course, both know you have to go back to the engine builder to determine how much heat is to be dissipated by cooling water, the pressure drop in the engine, etc. My experience shows it is sometimes difficult to get an accurate statement of those performance conditions from the engine manufacturer. Much of the data I have obtained has been misleading.

In one case, we received a value for heat to be dissipated by cooling water and later found that the engine manufacturer calculated and tested it and added 10 per cent to make it safe. Of course, when we received that figure for picking cooling equipment we added another 10 per cent for safety. In the end we had a value that was much higher than needed. Such a value may get you into trouble because you pick a pump that is too big for the job and it doesn't operate at its designed head.

You get into complications in cooling-system design because of misleading data. That is the point I want to emphasize. It is necessary to know fairly accurately what heat the engine will dissipate to the cooling water and in the lubricating-oil cooler, and what the pressure drop is through the engine. Similarly accurate date must be forthcoming from the cooler manufacturer.

Unless we get accurate data we can't buy a radiator, can't buy a heat exchanger or cooling tower that will accurately fit the job and perform the way we think it should.

## The Editor Summarizes

by pointing out that in view of these remarks, in addition to the engineering approach there are certain intangibles that must be considered. These will undoubtedly account for any of the conflicting experiences and viewpoints.

Certain factors are clearcut and can be tabulated.

1. There could be improvement in the pertinent data supplied by both the engine manufacturer and the equipment builder, particularly with respect to the margin of safety applied.

2. Having all of the basic design data, local conditions, type of service, water treatment or lack thereof, operating practices, etc., must be given weight.

3. It should be remembered that original cost, cost of operation and space requirements of cooling systems can be reduced by operation at the higher operating temperatures of which the engines are generally capable. Engine performance will generally be improved, too.

# Washington Slant

CMP REG. 1, basic rules of the Controlled Materials Plan, has been amended. Includes all of the changes and Directions 1 through 8 (except No. 5, revoked). Principal changes are amplified definition of controlled materials and provision for 100 per cent coverage of manufactures, eliminating the "open end" feature. Quantities of CMP materials for self-certification by manufacturers of Class B products has been increased.

COPPER SHORTAGE is cutting across the board, industry-wise and also in materials usage. Compressor Industry Advisory Committee, for example, cited that copper accounts for five per cent of their materials consumption. Yet if supplementary 1st Quarter Allotment is not granted they will be unable to make full use of steel allotment. About 20 per cent of production is on direct defense orders with most of balance going to vital defense-supporting industries. Operations on present allotments will be curtailed to about 50 per cent of plant capacity.

METAL SCRAP OF ALL TYPES continue in short supply. Iron, copper, brass, etc. have been much in the news. Less appreciated are shortages in other metals including lead and aluminum.

Despite authorization for withdrawal of up to 30,000 ton of lead from national stockpile and moves to stimulate import of pig lead, scrap is badly needed. Lead Consumers IAC proposed that lead scrap be removed from list of strategic materials to stimulate flow.

Aluminum scrap is in same boat. It is essential for mixing with primary aluminum for casting industry. NPA officials promised action to change disposition methods for military-generated scrap aluminum to channel it to smelters, reclaimers, etc. Currently is sold to highest bidder with no consideration of end-use.

PISTON RING IAC MEETING highlighted materials shortages in this field. As to molybdenum, NPA expects easing "probably" by mid-1952 as new production facilities go into operation. Alloys such as nickel, copper-bronze and tin, all used in piston ring manufacture, are expected to continue in short supply.

Committee asked NPA for some estimate of future pig iron production. Industry uses about 3,000,000 lb. annually of special grades and specified analysis types. Normal 90-day inventories are reportedly down below NPA-authorized (under Reg. 1) one month supply.

Scrap is the key and if the situation continues or worsens there is not expected to be enough pig iron to go around. Less scrap means more pig is used for steel production. Imports of pig iron are helping. No allocation of the metal is being considered.

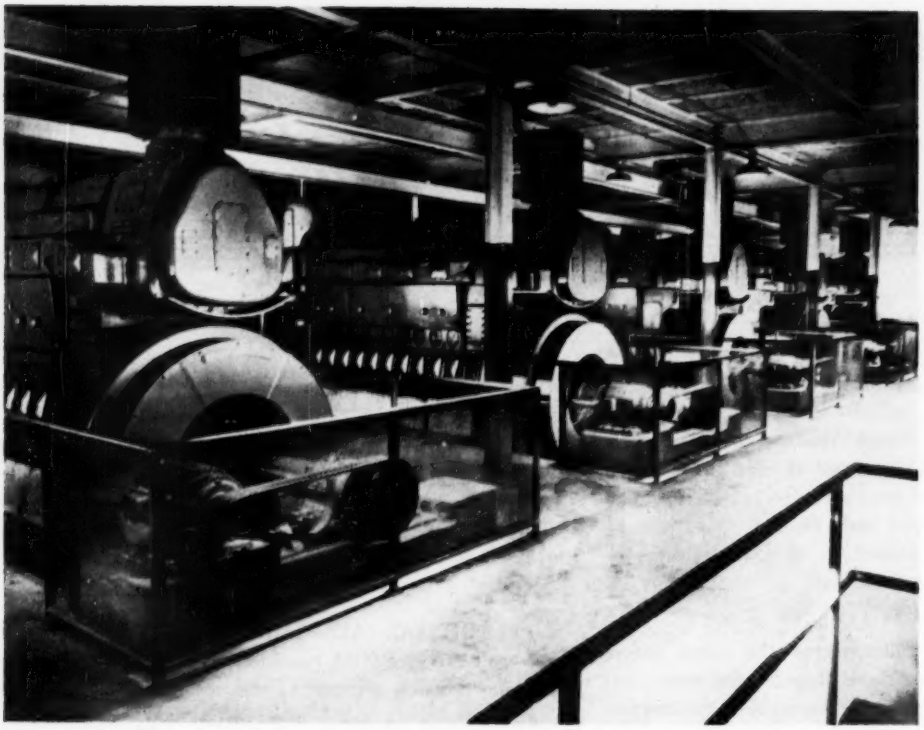
SUPPLEMENTAL ALLOTMENTS for hardship cases that are to receive NPA consideration include: Producers disproportionately affected by reductions, due to low level original allotments based on substitution possibilities that did not work out through no fault of the applicant: and small "single-line" producers of least essential items who are unable to continue operations on original allotments. NPA Administrator Manly Fleischmann emphasized that supplemental allotments include no brass mill products and only small amounts of other materials.

CONSTRUCTION MACHINERY IAC MEETING brought out not only material shortages but distribution problems. Demand is very heavy for tractors, cranes, shovels, bituminous pavers and rollers, all in short supply. Three solutions proposed by NPA were:

1. Tightening of criteria for issuance of DO orders.
2. Elimination of all DO ratings and setting up of a distribution pattern of end-use for each manufacturer.
3. Elimination of all DO ratings and scheduling of individual requirements of each manufacturer on a monthly or quarterly basis.

Committee preferred the first asking that ratings be applied sparingly by claimant agencies to assure machinery for only the most critical requirements.

OIL ADDITIVE SHORTAGE was averted by prompt and continuing cooperation among various manufacturing companies. Following a survey by PAD, arrangements were made by NPA to meet an immediate threat of shortage. As temporary expedient manufacturers shifted production to additives from less essential items. Other action included supply to manufacturers by NPA of necessary ingredients for proper operation and granting of certificates for rapid amortization of expanded facilities. Some of these are now in operation.



*Multi-engine installation of opposed piston engines in a stationary generating plant.*

# Maintenance Aspects of the Fairbanks-Morse Opposed-Piston Engine

***Two crankshafts? Two piston and rod assemblies in each liner? Sounds complicated on the face of it. But is it? After reading this article you will agree that "different" would be a far better term, and being different from more conventional engines, maintenance techniques vary. With a little "know-how" some of the less obvious advantages of these engines can be appreciated.***

Although there are now in service approximately 5,000,000 h.p. (about 3000 engines) of the Fairbanks-Morse opposed-piston engine the term "opposed-piston" still tends to confuse personnel who are concerned with engine maintenance. Actually, however, when one becomes familiar with the basic principles of the opposed-piston design, the engine becomes very simple and offers maintenance advantages not present in the coventional type diesel engine.

The Model 3D-8⅛ opposed-piston engine was used extensively by the Navy in submarines, landing ships, and patrol craft. Today the engine has become very popular for use in stationary, marine and locomotive applications. The stationary engines are offered as both dual-fuel and straight diesel.

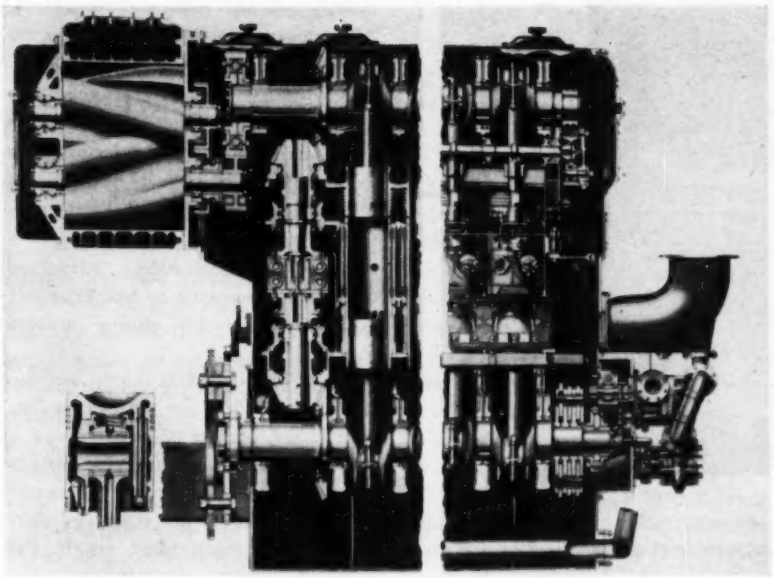
## General Description

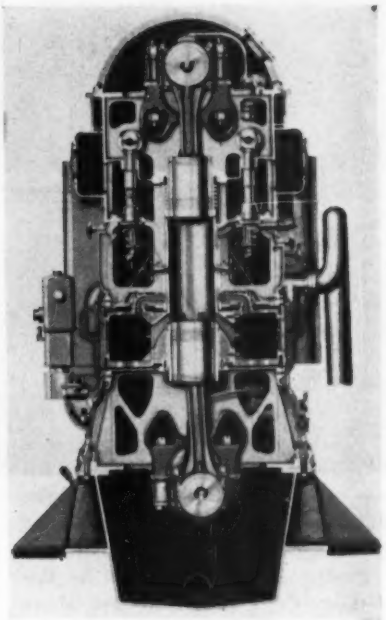
Before discussing maintenance of the opposed-piston engine, it is best to glance at the basic design of the engine as shown in the accompanying transverse and longitudinal cross-sections. From the former, it can be seen that the opposed-piston design allows maximum possible utilization of space for air receivers, exhaust manifolds, and injection equipment, resulting in the narrowest engine possible.

A welded steel cylinder block supports two crankshafts, one upper and one lower. The cast iron cylinder liners are held in the cylinder block by only four studs at their upper end. The two pistons in each cylinder form the combustion space as they approach each other. Two camshafts, one on each side of the engine, are chain driven from the control end of the upper crankshafts.

There are two injection pumps per cylinder, one driven from each camshaft. Fuel is injected through two pintle-type nozzles located diametrically across from each other at the center of the cylinder. Older engines used multi-hole type injection nozzles instead of the pintle nozzles.

The Roots type blower is driven from the opposite control end of the upper crankshaft by a flexible drive





*Above—Longitudinal cross-section of an 8½ in. by 10 in. opposed piston engine. Right—Transverse section of engine. Note that lower crankshaft leads upper by 12 degrees.*

gear. The blower forces scavenging air into the air receivers from which it enters the tangentially located air ports, which are covered and uncovered by the upper pistons. The tangential air ports impart a swirl to the air charge which continues as the air travels down the cylinder until it passes out the exhaust ports (which are covered and uncovered by the power pistons), and into the exhaust manifolds.

Cooling water enters the ends of the jacketed exhaust manifolds, circulates around the exhaust maifolds, around the exhaust ports, and then up into the cylinder liner water jacket, on both sides. Leaving the top of the cylinder jacket on one side, the cooling water then enters the outlet header.

Lube oil is supplied to the main bearings from a continuous header which runs the length of the lower crankcase, then rises to the level of the upper crankcase, and runs the length of it. From the main bearings, the oil travels through oil tubes in the crankshaft to lubricate the connecting rod bearings, and thence up through the drilled connecting rod to cool the piston crown.

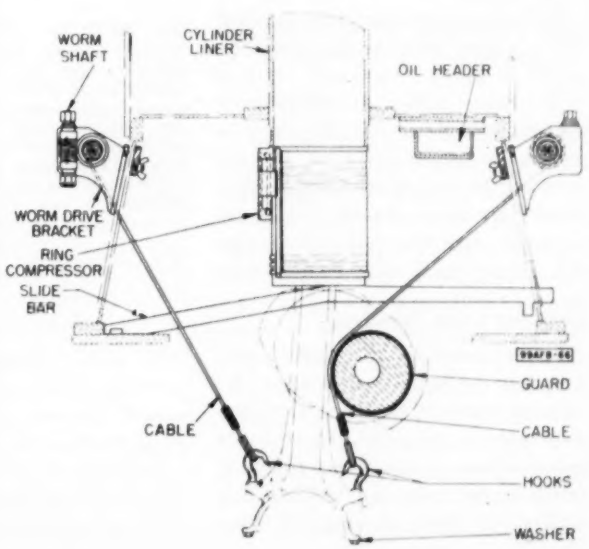
## Piston Removal

Removal of a lower piston is an extremely simple job because no additional parts such as water connections, valve gear, cylinder heads, fuel lines or fuel control linkage have to be removed or adjusted at reassembly. All that is necessary is to attach the piston winch as shown, disconnect the connecting rod from the crankshaft, lower the piston into the crankcase by means of the winch, and lift the piston and connecting rod assembly (135 lbs.) out by hand.

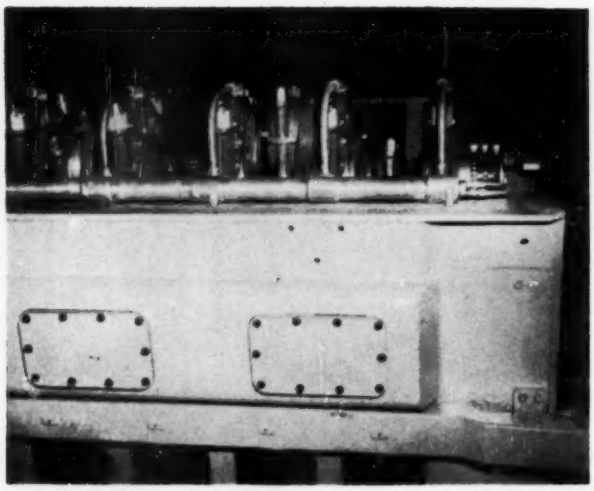
Installing a lower piston is the reverse of the above procedure, except that a sheet metal ring compressor is clamped around the piston before it is put on the slide bars in the crankcase.

Removal of an upper piston can be accomplished by first removing the top cover, disconnecting the piston insert and connecting rod assembly from the piston, and finally lowering the piston by means of a hook and rope to the lower crankcase where it can be removed by hand.

This operation, of course, first requires removal of the corresponding lower piston and removal of any




*Method of inserting lower piston into cylinder liner of opposed piston engine by means of piston winch.*



*Upper crankcase of opposed piston engine with top cover removed.*

carbon deposits at the combustion space in the center of the cylinders.

Replacing an upper piston by this method is the reverse of the above procedure, except that here again the sheet metal ring compressor is clamped around the piston before installing.

In cases where it is necessary to remove more than three or four upper pistons, it is usually easier to first remove the upper crank (which weighs about 2100 lb. for a 10-cyl. engine), and then take the piston and rod assemblies out the top without disturbing the lower pistons.

Removing an upper crankshaft sounds like a large order to the uninitiated, but actually it is simpler than removing cylinder heads, valve gear, water connections and fuel connections on a multi-cylinder conventional engine.

The upper crankcase of an opposed piston engine with the top cover removed is shown (top cover removal is a simple matter or removing a number of capscrews). In order to remove the upper crank, it is only necessary to slacken the timing chain, remove the main bearing caps, remove the connecting rod bearing caps and lift the crank out of the engine.

## Cylinder Liner Removal

Before removing a cylinder liner, it is first necessary to disconnect the adjacent water connections. These are the exhaust manifold to cylinder jacket elbows, the cylinder jacket to outlet header tube and the injection nozzles with their adapters. All these parts are in the injection pump compartment and can be reached and seen easily from the floor level. After removing the four cylinder liner hold-down stud nuts, the liner (which weighs about 250 lb.) can then be removed from the engine.

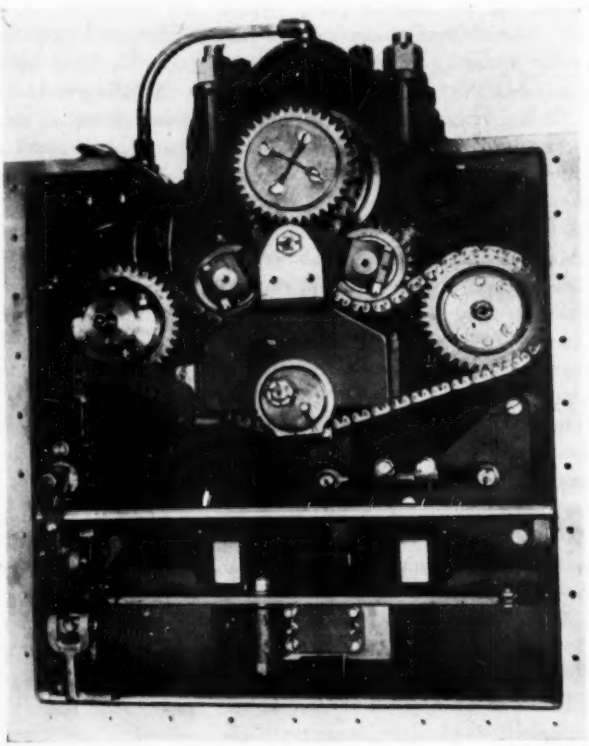
The air and exhaust ports will accumulate carbon over extended periods of time and consequently should be cleaned at regular intervals, depending upon the severity of service. Liner removal is not necessary if this is the only difficulty as these ports can be readily reached with a cleaning tool by removing inspection covers on the air receiver and on the exhaust manifold.

Although it is necessary to remove the injection nozzle and injection tube to remove a cylinder liner, it is not necessary to disturb fuel headers or fuel control linkages. This fact in itself is a distinct safety advantage when it is necessary to use relatively unskilled labor for engine maintenance.

After the cylinder liners are installed and all water fittings re-connected, the engine is subjected to a water pressure test before the pistons are re-installed. Since all the water connections which are disturbed during cylinder replacement are in the injection pump compartment, any leakage due to faulty installation can be readily seen and corrected.

Any leakage of water connections in the injection pump compartment cannot contaminate the lube oil since this compartment is not open to the crankcase.

During subsequent operation cooling water treatment on the opposed-piston engine, as on all engines having steel water passages is quite im-



*Camshaft drive for injection pumps of an opposed piston engine with top and end covers removed. Note the two idler sprockets and take up mechanism.*

portant. It is not only important that the water be softened to prevent scale, it must also be treated with a chromate compound to prevent corrosion of the water passages.

## Injection System Adjustments

As mentioned before, the injection pump camshafts are driven from the upper crankshaft by means of a silent chain (see illustration). There are two idler sprockets, attached to a central lever, so placed that when moved in one direction chain slack will be added on one side and removed on the other side and vice versa, thus rotating both camshafts simultaneously.

This is done simply by tightening or loosening a turnbuckle located just inside a control-end inspection cover and then checking the high cam point of the No. 1 injection pumps. Large changes in timing or differences between the two camshafts can be corrected by loosening the sprockets on the end of the camshafts and adjusting.

The injection pumps, because of their location, never have to be disturbed during normal engine overhauls. At present, in railroad service, instructions are not to remove the injection pump for inspection until after one-million miles.

It might be mentioned that in locomotive service it has not been found necessary to check either firing pressures or exhaust temperatures on the opposed-piston engine. Installation of a different injection pump, of course, requires re-shimming to obtain the correct plunger height (balancing fuel delivery).

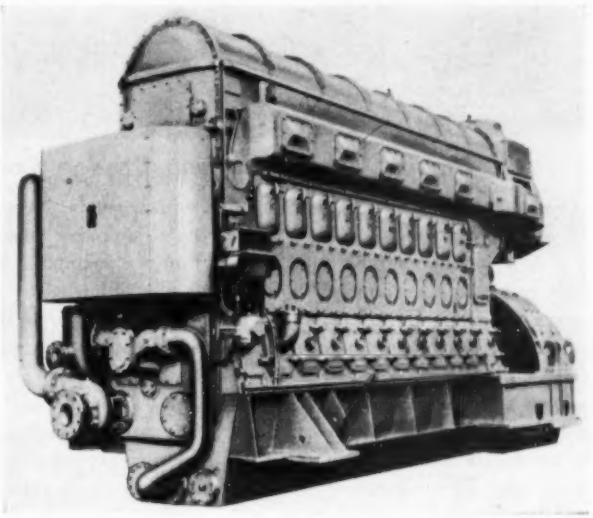
The pintle type injection nozzle is a small inexpensive unit that requires no adjustment. When testing proves the nozzle to be defective, it is discarded and replaced with a new one.

In discussing the injection system, it should be pointed out that the fuel oil lines are all located either outside of the engine or in the injection pump compartment. Since the injection pump compartment is not open to the crankcase in any manner, it is not possible for any leaking fuel connections to dilute the lube oil. Also when fuel leaks do occur, they can be readily located and repaired from the floor level.

## Crankshaft Phasing

In order to provide the proper timing of air and exhaust port opening and closing, the lower crankshaft of the O-P is set to lead the upper crank by 12 deg. When re-installing the upper crank, it is necessary that this relationship be re-established. This is done by rotating the lower crank until the flywheel pointer indicates No. 1 lower crank throw at 12 deg. past inner dead center, marked on the flywheel. The upper crankshaft is then positioned with the No. 1 crank throw in the inner dead center position (can be checked with a tool furnished with the engine or a protractor).

In instances where incorrect crankshaft timing is found after the engine is completely re-assembled, the timing can be changed by removing the spring coupling unit in the vertical drive, loosening the cone fit adjusting flange, and then rotating the lower crank while the upper crank remains stationary until the correct phasing is obtained. Removal of the vertical drive compartment cover gives access to the vertical drive shaft and spring coupling.



*Locomotive type of opposed piston engine and generating power unit.*

## Cylinder Block Maintenance

Although the cylinder block itself will require no maintenance under ordinary service, it is possible because of its welded steel construction to make major repairs to the block structure where engine accidents have damaged it, as might be the case in a locomotive wreck. Also, if necessary, parts of the block can be built up to precision welding and re-machined to size.

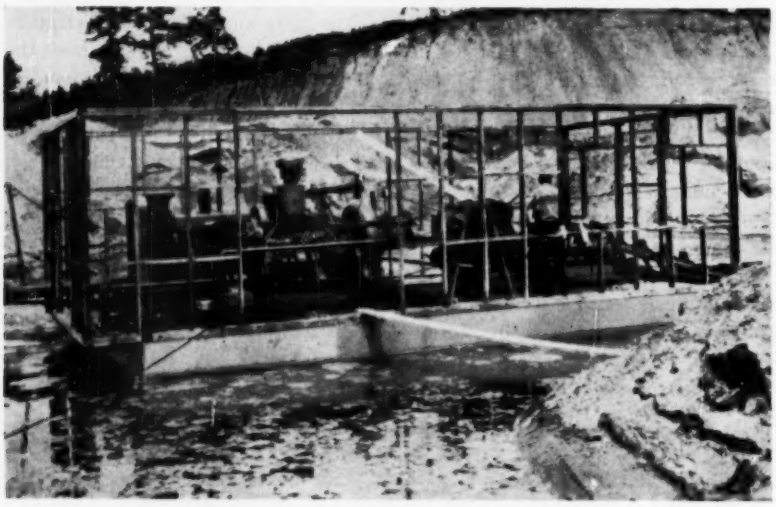
The cylinder block is purely a structural member and contains no water or oil passages which can scale up, corrode or develop leaks which could result in ruining the entire block.

The main and connecting rod bearings, being made of an aluminum-tin alloy are very light and easy to handle. The lower main bearings are removed and replaced in the same manner as in a conventional engine. The upper main bearings can be reached very easily from the top of the engine after the top cover is removed. The main bearing caps are quite light and can be lifted by hand. Both halves of the thrust bearings, of which there is one on each crankshaft, should be removed before removing the crankshaft.

## Conclusion

This article has attempted to point out the general procedure for those maintenance operations that are peculiar to the F-M opposed-piston diesel engine. In doing this, we also tried to show how these operations, although different from those normally encountered, are actually simpler and require less mechanical skill. Such engine parts as blowers, torsional dampers, water pumps, etc. have not been mentioned, because it is believed that their maintenance on the opposed-piston engine is very similar to that encountered on other engines.

# DIESEL BRIEFS



***Unique Gravel Pumping Dredge Control***

One engine with push button control performs a variety of operations on a new gravel-pumping dredge recently put into operation by the Consumers Sand and Gravel Company of Kalamazoo, Michigan. Instead of two or three engines or a combination of engines and electric motors as generally employed, a single General Motors 6-110 diesel engine does the entire job. This simplified arrangement has speeded up production, giving a more even flow of material, and reduced the hazards to driving machinery.

Main pump, priming pump, stone ladder and winches are all driven by the diesel through an ingenious system of power take-offs. Clutch mechanism of the eight-inch Hubscher stone ladder can be reversed and also permits "slippage" when a heavy obstruction is encountered or in the event the ladder is buried by a cave-in. In such cases the ladder is automatically rendered inoperative until the operator, by throwing it into reverse can pull it away from the obstruction. This feature prevents damage to ladder parts and driving machinery thereby eliminating costly downtime periods. It also enables the single operator required on the dredge to perform maintenance and other duties rather than stand constant guard at the controls.

A suction pipe 75 ft. long is employed and will dredge to a depth of 50 ft. without adding additional pipe. All movable parts are easily accessible for servicing.

### German Pistons

Open capacity for aluminum automotive type pistons available in its Western Germany plant is being offered to help meet U. S. needs by the Karl Schmidt Works of Neckarsulm. The plant has equipment to manufacture pistons to U. S. specifications and, with the aluminum situation in Germany less tight than here, can supply up to 50,000 per month. The firm manufactures standard U. S. automotive pistons for the replacement market in Europe. American representative is The Ore & Chemical Corporation, 80 Broad Street, New York City.

In addition to producing standard aluminum pistons, the firm also manufactures bonded bi-metallic pistons, particularly useful in heavy duty engines, for the European market. They are licensed in Germany to use the Al-Fin process of molecularly bonding aluminum to ferrous metals.

### Pennsylvania RR Diesel Orders

A $60,000,000 order for new diesel electric locomotives and freight cars was announced recently by the Pennsylvania Railroad. Included are 180 diesel electric locomotives and 5000 modern freight cars. With deliveries during this year and early in 1953, this equipment will add significant reinforcement to the 1168 diesel locomotives and 26,860 new freight cars already purchased as a part of the post-war and preparedness program. The $266,000,000 program announced in 1949, then the largest undertaking in the road's history, has grown to almost two and a half times its original size.

The new diesels on order include 11 road passenger, four road freight, and 165 yard and road switching locomotives, totalling about 291,000 hp. They will be built by American Locomotive Company, Baldwin-Lima-Hamilton, Electro-Motive Division of General Motors, and Fairbanks-Morse, with deliveries scheduled to commence in April. When these engines, costing $30,203,000 are received, the railroad's diesel fleet will include 1348 locomotives with a total of 2,605,770 hp. To put this diesel horsepower into service is costing the sum of $310,600,000.

### GM Diesel Courses

A series of one week courses in diesel engine mechanics open to owners and operators of diesel powered equipment on the iron range is being given at the Municipal Golf Clubhouse in Hibbing, Minnesota. The courses started January 7.

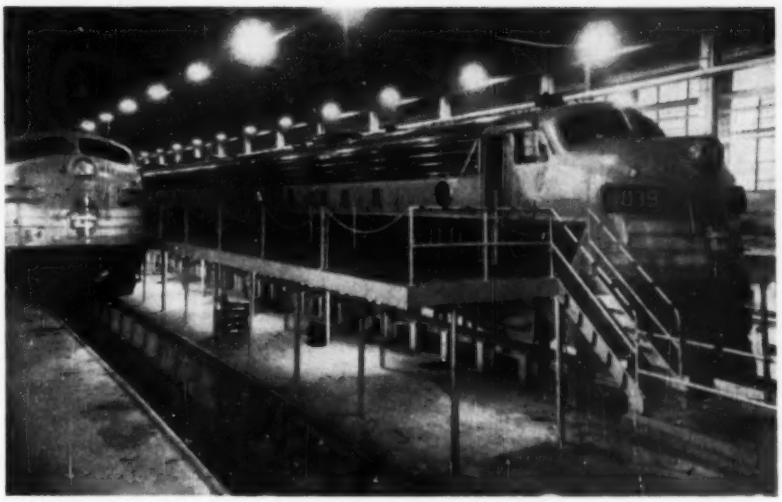
Borchert-Ingersoll, Inc., Minnesota distributors of General Motors Detroit Diesel Engine Division and their local dealer the General Diesel and Equipment Company, Inc., are the sponsors.

# DIESEL BRIEFS

It is expected that the school will be in session for a period of three months. It is one of nine similar units maintained by the Diesel Division, offering instruction in factory-approved servicing and maintenance procedures.

The schools are transported by special van-type diesel powered trucks and regularly consist of over four tons of training aids, including live and cut-away engines, sub-assemblies, movies, charts and slide films. Instruction on engine tune-up, trouble shooting, distmantling and repair are being offered. Mechanics attending the school do this type of work themselves using factory approved methods and tools under the direction of factory trained instructors.

Detroit Diesel opened its first mobile training school in Hibbing over four years ago, because of the tremendous amount of GM diesel powered equipment in the area. This year's school, the 4th to be held in this area, is the largest and most advanced of any school the Division has yet offered. Over 10,000 men in the United States and Canada have attended these schools, it is claimed.



*Calgary Diesel Shop in Operation*

Canadian Pacific Railway's new million dollar shop at Alyth Yard at Calgary, Alberta is the first large one of its kind in Canada to be built from the ground up, others having been adaptations of existing steam locomotive facilities. The new shop is 260 ft. long and has four pits running its length, each of which will accommodate a 208-ft. diesel. Platforms to the height of cab and engineroom doors allow for quicker turn-around work.

Heat and lighting facilities of the new shop are of the latest design and improve working conditions immeasurably. An air-changing system has been installed to get rid of the exhaust gases when running engines in shop.

Locomotives fuel up from platforms outside the shop—oil being piped there from a 175,000 gal. storage tank.

General construction of the diesel shop is asbestos siding on steel frame. Excellent lighting facilities are provided under the platforms for service work and a handy stores section is at one side of the building.

For the lube oil storage system there are three tanks for clean oil with 5000-gal. capacity, and two for dirty oil with 4000-gal. capacity. An oil testing laboratory with a technician is also available in accordance with the most modern practice.

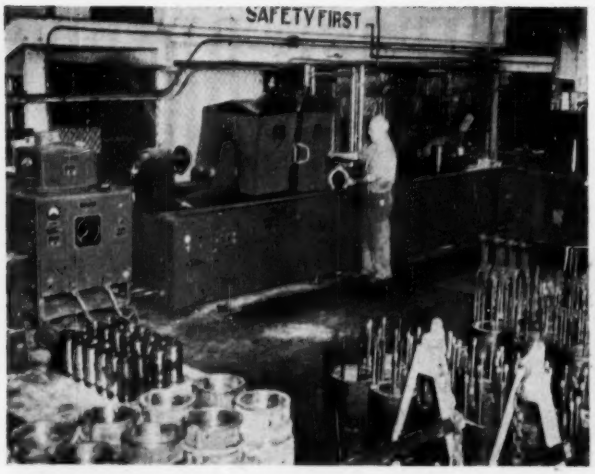
## Growing Demand for Petroleum Blessing in Disguise

The United States' growing demand for petroleum products would be a blessing in disguise in event of an all-out war, a member of General Motors Business Research Staff told the American Society of Mechanical Engineers recently. Reporting on the "Impact of Defense Activities on Petroleum Fuel Supplies", Adam K. Stricker, Jr., declared the "expansion of our civilian uses actually provides a more substantial cushion to meet military needs."

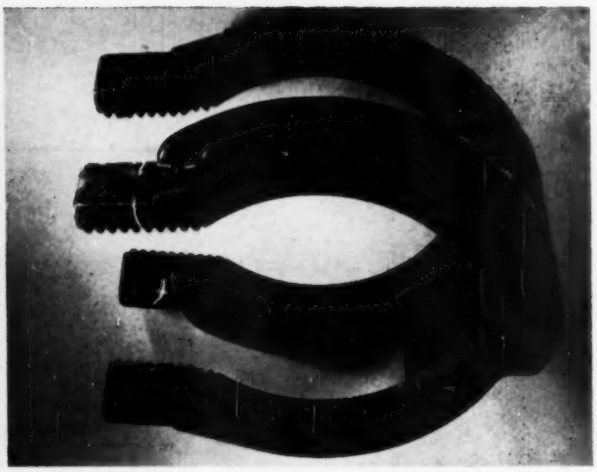
In his survey of oil refining and reserve capacities of the United States and other petroleum producing nations, Mr. Stricker pointed out that during the first six months of 1951, motor vehicle gasoline output reached an annual rate of approximately one billion bbl., compared to 600 million bbl. in 1939, an increase of about 73 per cent.

"Civilian gasoline demands absorb the available supply, and some may draw the conclusion that there is no greater margin today to meet increased requirements than there was in 1939. This is not the case, however, as it is far easier to meet military needs by diverting the necessary gasoline from a large daily output than it is from a much smaller," Mr. Stricker declared.

He explained that more than 6,000,000 bbl. of refined petroleum products are delivered daily in the United States, and oil companies are expanding their production as fast as possible to meet not only the increasing civilian demand but also the eventuality of all-out-war.




*Large Magnaflux unit at Atlantic Coast Line shop can handle parts from the smallest spring to crankshafts. The 5000-amp., ac. portable power pack can also be moved to other areas for dry powder inspection. Zyglo unit is at extreme right.*



*Indications of a fatigue crack in EMD connecting rod basket are immediately apparent under Magnaglo inspection. In addition to the magnetic particles in the carrying medium, a fluorescent material activated by ultra-violet light is used.*

# Locomotive Parts Inspection with Magnetism, Fluorescence and Black Light

**Modern developments and techniques employed to detect incipient cracks not ordinarily visible to the eye were recently outlined before the Southwestern Railway Club by the author. This abstract of his talk details the processes involved; applications, both during manufacture and later maintenance; and advantage accruing from this simple and effective method of inspection.**

*by Roy O. Schiebel, Jr.*
*Magnaflux Corporation*

MAGNAFLUX is the oldest and best known method of examination of railroad equipment parts, at times of overhaul, for defects which are not ordinarily seen by visual inspection. This "dry method" of visual inspection has been in use in steam locomotive "back shops" and roundhouses for the past 15 years or more.

## Processes

NEW DEVELOPMENTS IN MAGNAFLUX INSPECTION have been made, to keep in step with changing inspection requirements. The problem of inspection and maintenance of locomotive diesel engine parts has been found to be more comparable to those of the aircraft engine, than to the steam locomotive parts previously inspected. Increasing labor costs also made faster, more economical and more conclusive inspection procedures necessary.

Thought also was given to making Magnaflux inspection of more importance, and to raising the prestige of the job of the Magnaflux inspector to a higher level—it formerly was considered in some places only a step or so above the lowest rated job in the shop.

MAGNETIC MATERIALS alone are suitable for Magnaflux inspection. The principle is relatively simple, consisting primarily of magnetizing the parts to be inspected by means of a high-amperage, low-voltage electric current. Should a crack be present in the part, there exists an interruption in the magnetic field with polarity forming on either side of the crack.

This polarity may be likened to the poles of a small horseshoe magnet. Then when finely divided iron particles are applied to the surface of the part, they are attracted to the crack and held by the polarity, thereby outlining the boundary of the flaw.

"DRY METHOD" INSPECTION with Magnaflux as employed on steam locomotive parts and still having some application, consists of dusting dry Magnaflux powder on to the magnetized part by means of a shaker can, bulb spray or an engineered powder blower. In the latter method the air acts as a medium for distributing the finely divided particles (available in gray, red or black colored powders) to the part being inspected—the color chosen to make the best contrast on the background of the part to be inspected.

MAGNAFLO, AN IMPROVED MAGNAFLUX METHOD, is recommended for inspection of diesel engine parts. With Magnaglo the finely divided magnetic particles are suspended in a light oil or refined kerosene which acts as a carrier. The magnetic particles are also

*Portable power pack applied to dry powder inspection. Hairpin-type coil magnetizes gear teeth as powder is applied by automatic blower to define any fissure.*

*Indications of service cracks occurring in engine valves as seen under Zyglo inspection. Method relies on actual penetration of fluorescent material: No magnetism is used.*

coated with a flourescent material which cause them to glow very brilliantly when activiated by near ultraviolet light known as "Black Light".

Reasons for preference of Magnaglo by a majority of railroads in the inspection of diesel engine parts are listed as follows:

*1. An oil film on parts is permissible, but they must be clean. With the dry method the parts must not only be clean but perfectly dry, to obtain powder mobility for an effective inspection.*

*2. A quicker and better magnetic particle coverage of the part is obtained with the liquid Magnaglo.*

*3. The visibility of the indication of a crack is increased immeasurably due to the fluorescence. The usual easy-to-miss indication of a crack seems to beckon the eyes of the inspector when Magnaglo is employed. This point is quite important, particularly on an everyday routine inspection job which may tend to become monotonous.*

*4. The Magnaglo "bath" may be used over and over with only the loss due to evaporation of the oil and carry off of the fluorescent particles on the parts being inspected.*

*5. This type of inspection will usually be found to be faster, more economical and more conclusive.*

ZYGLO FOR NON-MAGNETIC MATERIALS employs a fluorescent penetrant inspection method. No magnetization is involved. The method relies entirely on the physical penetration of the fluorescent liquid. The operational sequence is as follows:

*1. Penetration of the fluorescent material into the defect.*

*2. Removal of excess penetrant from the surface of part by washing with hot or cold water, preferably as a spray.*

*3. Developing the indication if necessary for greater sensitivity, using wet or dry developer.*

*4. Inspection under the "Black Light". A brilliant fluorescent indication will mark the defect (Zyglo indication is similar in appearance to that of Magnaglo).*

## Applications in Manufacture

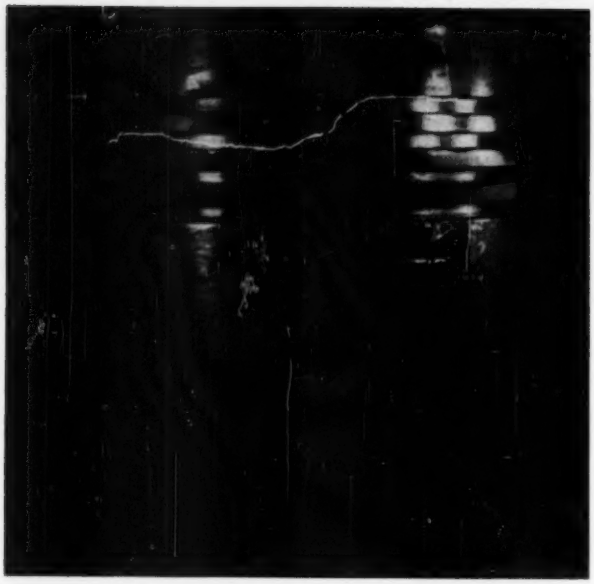
BUILDERS USE MAGNAGLO AND ZYGLO in the manufacture of diesel locomotives. In one large plant these methods of inspection are employed in the Receiving Inspection Department, where all incoming parts are inspected.

Specially designed large Magnaglo units handle the crankshafts and camshafts on final inspection before they go into the engine. Standard "wet method" Magnaflux units employing Magnaglo are used to inspect piston pins and miscellaneous small parts.

Two noteworthy units at this plant are those recently designed to fit directly in the production line. One unit is designed to handle the entire daily production of both fork and blade connecting rods. The unit is so designed that it is semi-automatic in nature and requires only a push button control for processing. The connecting rods are handled automatically and the inspector is required only to look at the part under the "Black Light". The other specially designed unit is located in the piston and piston carrier line, where a similar semi automatic inspection with Magnaglo is conducted.

INHERENT RAW MATERIALS DEFECTS such as excessive stringers or nonmetallics in rolled bar stock, laminations in steel plates, etc. are readily detected. Cold laps or shuts in rough forgings, shrinkage cracks and porosity in unfinished castings may also be found by Magnaglo inspection.

Processing faults which may be introduced into parts during manu-



*Fatigue crack in an aluminum piston, invisible to the naked eye, is apparent with Zyglo inspection.*

facturing procedures are readily disclosed. Such imperfections may include lack of penetration as well as surface and sub-surface cracks in welds, heat-treat cracks, straightening and grinding cracks.

REDUCTION IN FATIGUE FAILURES in locomotive diesel engine parts has been accomplished by better control in manufacture, by use of Magnaflux and other methods of inspection. Better design also has contributed to this reduction in failures, by attention to such things as elimination of sharp corners, keyways, oil holes in highly stressed areas, and by allowing generous fillets in changes of sections. Highly finished or polished surfaces also tend to increase life of parts in service.

## Applications in Maintenance

FATIGUE CRACKS, however, are still the type of discontinuity most generally found in parts inspected at the time of overhaul. Such defects which develop in service may be due to one or more of several causes such as a manufacturing imperfection, improper design, damage in handling or to improper alignment. Such cracks are surface in nature and despite the fact that they are usually invisible to the naked eye, are readily shown with Magnaglo.

Once a fatigue crack develops there is no way to determine its probable rate of further development. The part may fail in a short time or continue in service without trouble for an indefinite time. Fortunately the fatigue-type defect is usually slow enough in propagating so as to allow detection with Magnaglo at inspection periods.

USE ZYGLO TO INSPECT PARTS such as exhaust valves, cylinder heads, aluminum pistons, bearing cages and spacer rings. The most critical part requiring such inspection are exhaust valves. Some roads report that they find an average of about two per cent defective valves at overhaul, and by removal of such valves, road failures have been reduced substantially. One road reports that their valve failures have been reduced 75 per cent since they started Zyglo inspection.

This process is not suitable for inspection of magnetic parts, although it is sometimes so used. It requires four or five times as long to do a job with Zyglo as compared with Magnaflux on a magnetic part, and it may not give as sure an indication of a crack, particularly if the part has been working in oil. Where oil or grease has worked into the crack the penetrant will not work into the defect as well as it should.

## Some Results

RECORD OF ONE YEAR'S TESTS made by an important Western railroad using Magnaglo and Zyglo inspection showed a total of 7721 conducted on 37 categories of parts. Of the total, 304 parts were scrapped while 33 more, found defective, were repaired. Considerable savings resulted from these repairs wherein incipient cracks were eliminated by welding and returned to service as good as new.

Total savings from the detection of defects in the entire 337 pieces, each one of which was potential failure with probable damage to other parts and some possible train detentions, are almost impossible to estimate. The experience of this road is representative of others using this type of inspection.

AIDS TO THE INSPECTOR making the parts examination at the time of overhaul are contined in a "Railroad Inspection Manual" recently published by the organization building the equipment. It contains sections on the theory of inspection with Magnaflux and Magnaglo, operating procedures, and specific instructions on how to handle and inspect each of the critical parts of the locomotive diesel engine.

Maintenance instruction sheets to be published by the locomotive builders are being planned, in which a more complete evaluation of each critical part will be made. By this means the manufacturer may determine what type of discontinuity may be acceptable and not affect the serviceability of the part, or list the type of defect which would cause the rejection of the part.

IMPORTANCE OF THESE MODERN INSPECTION METHODS is emphasized by what happened on a well known railroad. The Superintendent of Motive Power, about 5 years ago, said that since they were dieselizing they would have no further use for Magnaflux. For the first two years or so after this things ran along smoothly on this road, but as the mileage piled up and the diesel fleet increased, it became evident that considerable thought would have to be given to the specialized problems of maintenance of the diesel locomotives.

Today this road has installations of both Magnaglo and Zyglo not only at the major diesel engine overhaul shops but also at locations where running maintenance inspections are performed.

# THE BUYERS' GUIDE

*The Buyers' Guide is a service to our readers and to advertisers in* **Diesel Power and Diesel Transportation.** *Here will be found in a convenient list for quick reference diesel engines and accessories advertised in this magazine and a substantial number of other engines and products of leading manufacturers who advertise in this classified directory.*

# DIESEL ENGINE DIRECTORY

## *Two-Cycle Diesel Engines*

### LOW SPEED, up to 365 r.p.m.

#### Horsepower, 101 to 500

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

#### Horsepower, 501 to 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

#### Horsepower, Over 1000

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

### MEDIUM SPEED, 365 to 700 r.p.m.

#### Horsepower, 51 to 100

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

#### Horsepower, 101 to 500

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

#### Horsepower, 501 to 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

#### Horsepower, over 1000

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

### MEDIUM HIGH SPEED, 700 to 1200 r.p.m.

#### Horsepower, 1 to 50

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

#### Horsepower, 51 to 100

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

#### Horsepower, 101 to 500

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

#### Horsepower, 501 to 1000

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

### Horsepower, over 1000

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

## HIGH SPEED, over 1200 r.p.m.

### Horsepower, 1 to 50

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

### Horsepower, 51 to 100

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

### Horsepower, 101 to 500

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

### Horsepower, 501 to 1000

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

# *Four-Cycle Diesel Engines*

## LOW SPEED, up to 365 r.p.m.

### Horsepower, 101 to 500

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

THE RATHBUN-JONES ENGINEERING CO.
823 Spencer St.
Toledo 1, Ohio

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, California

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

### Horsepower, 501 to 1000

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

FULTON IRON WORKS CO.
1259 Delaware Ave.
St. Louis 14, Mo.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

THE RATHBUN-JONES ENGINEERING CO.
823 Spencer St.
Toledo 1, Ohio

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, California

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

### Horsepower, over 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

FULTON IRON WORKS CO.
1259 Delaware Ave.
St. Louis 14, Mo.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Ave.
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

THE RATHBUN-JONES ENGINEERING CO.
823 Spencer St.
Toledo 1, Ohio

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, California

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

## MEDIUM SPEED, 365 to 700 r.p.m.

### Horsepower, 1 to 50

WITTE ENGINE WORKS
OIL WELL SUPPLY DIVISION
of UNITED STATES STEEL COMPANY
1600 Oakland Avenue
Kansas City 3, Mo.

### Horsepower, 51 to 100

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

ENTERPRISE ENGINE & MACHINERY CO.
18th & Florida Streets
San Francisco 10, California

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

### Horsepower, 101 to 500

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, Calif.

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

WORTHINGTON PUMP & MACHINERY CORP.
Harrisor, N. Y.

### Horsepower, 501 to 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Ave.
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, California

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

### Horsepower, over 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

THE NATIONAL SUPPLY COMPANY
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

## MEDIUM HIGH SPEED 700 to 1200 r.p.m.

### Horsepower, 1 to 50

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

HILL DIESEL ENGINE CORP.
238 Mill Street
Lansing, Michigan

THE LATHROP ENGINE CO.
Holmes St.
Mystic, Conn.

STERLING ENGINE CO.
1270 Niagara St.
Buffalo 13, N. Y.

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, California

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

WITTE ENGINE WORKS
OIL WELL SUPPLY DIVISION
of UNITED STATES STEEL CO.
1600 Oakland Avenue
Kansas City 3, Mo.

### Horsepower, 51 to 100

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

HILL DIESEL ENGINE CORP.
238 Mill Street
Lansing Michigan

THE LATHROP ENGINE CO.
Holmes St.
Mystic, Conn.

MURPHY DIESEL CO.
5317 West Burnham St.
Milwaukee 14, Wisconsin

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

STERLING ENGINE CO.
1270 Niagara St.
Buffalo 13, N. Y.

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, California

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

### Horsepower, 101 to 500

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.

MURPHY DIESEL CO.
5317 West Burnham St.
Milwaukee 14, Wisconsin

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

STERLING ENGINE COMPANY
1270 Niagara St.
Buffalo 13, N. Y.

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, California

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

### Horsepower, 501 to 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

THE NATIONAL SUPPLY CO.
DIESEL DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Ave.
Springfield 99, Ohio

STERLING ENGINE COMPANY
1270 Niagara St.
Buffalo 13, N. Y.

### Horsepower, over 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

## HIGH SPEED, over 1200 r.p.m.

### Horsepower, 1 to 50

FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

INTERNATIONAL HARVESTER CO.
180 N. Michigan Ave.
Chicago 1, Ill.

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

WITTE ENGINE WORKS
OIL WELL SUPPLY DIVISION
of UNITED STATES STEEL CO.
1600 Oakland Avenue
Kansas City 3, Mo.

### Horsepower, 51 to 100

CUMMINS ENGINE CO., INC.
Columbus, Indiana

FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

INTERNATIONAL HARVESTER CO.
180 N. Michigan Ave.
Chicago 1, Ill.

STERLING ENGINE COMPANY
1270 Niagara St.
Buffalo 13, N. Y.

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

### Horsepower, 101 to 500

CUMMINS ENGINE CO., INC.
Columbus, Indiana

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

INTERNATIONAL HARVESTER CO.
180 N. Michigan Ave.
Chicago 1, Ill.

THE LATHROP ENGINE CO.
Holmes St.
Mystic, Conn.

MACK MANUFACTURING CORP.
Empire State Bldg.
New York 1, N. Y.

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

### Horsepower, 501 to 1000

CUMMINS ENGINE CO., INC.
Columbus, Indiana

# DIESEL PLANT ACCESSORIES

## Adapters

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

## Additives

**See also "Fuel Oil Additives"; "Fuel Oil Treatment, Diesel"**

LUBAL, INC.
375 West Rich Street
Columbus 8, Ohio

WYNN OIL CO.
1151 W. Fifth St.
Azusa, California

## Air Cleaners

**See also "Air Filters"; "Filters, Air"; etc.**

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul 5, Minn.

VORTOX CO., INC.
Claremont, Calif.

## Air Cleaners, Oil Washed

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul 5, Minn.

## Air Compressor Oils

MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Oklahoma

THE TEXAS CO.
135 East 42nd St.
New York 17, N. Y.

## Air Compressors

**See also "Compressors, Air"; "Starting Units".**

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

QUINCY COMPRESSOR CO.
217 Maine Street
Quincy, Ill.

READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

## Air Compressors, Diesel Driven

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Illinois

## Air Compressors, Diesel Starting

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Illinois

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

QUINCY COMPRESSOR CO.
217 Maine Street
Quincy, Ill.

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

## Air Filters

**See also "Air Cleaners"; "Filters, Air"; etc.**

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.

CONTINENTAL AIR FILTERS, INC.
2520 Helm Street
Louisville 1, Kentucky

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul 5, Minn.

## Air Filters, Crankcase

**See also head under "Breather Caps" etc.**

FRAM CORP.
Providence 16, R. I.

## Air Tools

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

## Air Velocity Meters

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle Street
Chicago 10, Ill.

## Alarm Systems, Pressure & Temperature

**See also headings under "Controls".**

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee

PENN CONTROLS INC.
Goshen, Indiana

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.

## Alloy Steel Bolts & Nuts

**See also "Bolts"; headings under "Nuts" and "Studs"; "Connecting Rods".**

ERIE BOLT & NUT COMPANY
1325 Liberty Street
Erie, Pa.

## Alumibond Pistons

ARTHUR TICKLE ENGINEERING WORKS
21 Delevan Street
Brooklyn 31, N. Y.

## Ammeters

**See also "Meters, Electrical Indicating".**

BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.

WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Ave.
Newark 5, N. J.

## Ammeters—Tong Test (Clamp On) Type

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio

WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Ave.
Newark 5, N. J.

## Antifreezes

THE TEXAS CO.
135 East 42nd St.
New York 17, N. Y.

## Anti-Rust Compounds

**See also "Rust Preventatives"**

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

## Asbestos, Sheet

VICTOR MFG. & GASKET CO.
5750 W. Roosevelt Road
Chicago 50, Ill.

## Automotive Diesel Fuel

**See also "Fuel Oil, Diesel"; "Oils, Diesel Fuel"; "Diesel Fuel Oils"; "Motor Fuels"**

STANDARD OIL CO. OF CALIFORNIA
225 Bush Street
San Francisco, Calif.

THE TEXAS COMPANY
135 East 42nd Street
New York 17, N. Y.

## Automotive Greases

**See also "Greases," "Lubricants"**

THE TEXAS CO.
135 East 42nd St.
New York 17, N. Y.

## Automotive Lubricating Oils

THE TEXAS CO.
135 East 42nd St.
New York 17, N. Y.

## Auxiliary Combination Units

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Illinois

GRIFFIN EQUIPMENT CORP.
880 East 141st Street
New York 54, N. Y.

## Auxiliary Diesel Generating Sets

**See also "Diesel Generating Sets"; "Emergency Diesel Generator"; "Emergency Lighting Plants"; "Packaged Generators".**

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

## Babbitt Metal

ARTHUR TICKLE ENGINEERING WORKS
21 Delevan Street
Brooklyn 31, N. Y.

## Balancing Machines

ARTHUR TICKLE ENGINEERING WORKS
21 Delevan Street
Brooklyn 31, N. Y.

## Bases, Welded

GRAVER TANK & MFG. CO., INC.
East Chicago, Indiana

METALOCK REPAIR SERVICE, INC.
36-15 48th Avenue
Long Island City 1, N. Y.

### Batteries, Diesel Locomotive

See also "Starting Batteries, Storage"

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

### Batteries, Diesel Starting

See also "Starting Batteries, Storage"

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

### Batteries, Marine Storage

CRESCENT BATTERY & LIGHT CO., INC.
819 Magazine Street
New Orleans 12, La.

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

### Batteries, Stationary Storage

CRESCENT BATTERY & LIGHT CO., INC.
819 Magazine Street
New Orleans 12, La.

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

### Battery Service Accessories

CRESCENT BATTERY & LIGHT CO., INC.
819 Magazine Street
New Orleans 12, La.

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

### Bearing Rebabbitting

SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.

### Bearings, Aluminum

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

ARTHUR TICKLE ENGINEERING WORKS
21 Delevan Street
Brooklyn 31, N. Y.

### Bearings, Bronze

See also "Bronze Bearings"

THE BUNTING BRASS AND BRONZE CO.
715 Spencer Street
Toledo 9, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

### Bearings, Bronze and Steel, Babbitt-Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

DETROIT ALUMINUM AND BRASS CORP.
3975 Christopher
Detroit 11, Michigan

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

ARTHUR TICKLE ENGINEERING WORKS
21 Delevan Street
Brooklyn 31, N. Y.

### Bearings, Lead, Bronze

THE BUNTING BRASS AND BRONZE CO.
715 Spencer Street
Toledo 9, Ohio

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

### Bearings, Piston Pin

THE BUNTING BRASS AND BRONZE CO.
715 Spencer Street
Toledo 9, Ohio

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Mich.

JOHNSON BRONZE CO.
470 S. Mill St.
New Castle, Pa.

### Bearings, Self-Lubricating

THE BUNTING BRASS AND BRONZE CO.
715 Spencer Street
Toledo 9, Ohio

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

### Bearings, Sleeve, Copper-Lead Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

DETROIT ALUMINUM AND BRASS CORP.
3975 Christopher
Detroit 11, Michigan

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

### Bellows

TITEFLEX, INC.
500 Frelinghuysen Ave.
Newark 5, N. J.

### Bellows, Stainless Steel

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tenn.

### Benches, Roller, Cabinet

SNAP-ON TOOLS CORP.
8064-28th Avenue
Kenosha, Wisconsin

### Blowers and Compressors, Scavenging and Supercharging

See also "Supercharging Blowers"; other headings under "Blowers"; "Turbochargers and Superchargers"

BROWN BOVERI CORP.
19 Rector St.
New York 6, N. Y.

DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, N. J.

READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.

### Blowers, Centrifugal

DR. ALFRED J. BUCHI
Engineering Office
Winterthur, Switzerland
U. S. Office, 520 Munsey Bldg.
Washington 4, D. C.

### Blowers, Scavenging and Supercharging

DR. ALFRED J. BUCHI
Engineering Office
Winterthur, Switzerland
U. S. Office, 520 Munsey Bldg.
Washington 4, D. C.

### Boilers, Exhaust Gas

See also "Waste Heat Boilers"

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

THE SIMS COMPANY
1402 E. 18th St.
Erie, Pa.

### Boilers, Waste Heat

See note under heading above.

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

HENRY VOGT MACHINE CO.
1000 West Ormsby St.
Louisville 10, Ky.

### Bolts

See also "Alloy Steel Bolts & Nuts"; heading under "Nuts" and "Studs"; "Connecting Rods"

ERIE BOLT & NUT COMPANY
1325 Liberty St.
Erie, Pa

### Boring Bars

VAN NORMAN COMPANY
AUTOMOTIVE DIVISION
Springfield 7, Mass.

### Brake Drum Lathes

VAN NORMAN CO.
AUTOMOTIVE DIVISION
Springfield 7, Mass.

### Breather Filters

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

### Breathers, Crankcase

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul 5, Minn.

### Bronze Bar Stock

See also "Bars, Bronze"

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

### Bronze Bar Stock, Semi-Finished

THE BUNTING BRASS AND BRONZE CO.
715 Spencer Street
Toledo 9, Ohio

FEDERAL MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

### Bronze Bearings

See also "Bearings, Bronze"

THE BUNTING BRASS AND BRONZE CO.
715 Spencer Street
Toledo 9, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Mich.

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

## Bronze Washers

THE BUNTING BRASS AND BRONZE CO.
715 Spencer Street
Toledo 9, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE COMPANY
470 S. Mill Street
New Castle, Pa.

## Bushings, Bronze

THE BUNTING BRASS AND BRONZE CO.
715 Spencer Street
Toledo 9, Ohio

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE COMPANY
470 S. Mill Street
New Castle, Pa.

## Bushings, Torque, Rubber Bonded to Metal, Shear Type

LORD MANUFACTURING CO.
1635 West 12th St.
Erie, Pa.

## Cables, Battery

THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

## Carbon Solvents

LUBAL, INC.
375 West Rich Street
Columbus 8, Ohio

OAKITE PRODUCTS, INC.
22 Thames Street
New York 6, N. Y.

## Cast Camshafts

CAMPBELL, WYANT & CANNON FOUNDRY CO.
Muskegon 83, Mich.

## Cast Crankshafts

See also "Crankshafts".

CAMPBELL, WYANT & CANNON FOUNDRY CO.
Muskegon 83, Mich.

## Casting Repairs

METALOCK REPAIR SERVICE, INC.
36-15 48th Avenue
Long Island City 1, N. Y.

WASHINGTON IRON WORKS
Sherman, Texas

## Centrifugally Cast Cylinder Liners

See also "Liners, Diesel Cylinder"; "Cylinder Liners".

CAMPBELL, WYANT & CANNON FOUNDRY CO.
Muskegon 83, Michigan
New York 6, N. Y.

## Centrifugal Purifiers, Fuel Oil

See also "Oil Purification Systems, Centrifugal".

THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.

THE SHARPLES CORP.
2300 Westmoreland St.
Philadelphia 40, Pa.

## Centrifugal Purifiers, Lube Oil

See heading above.

THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.

THE SHARPLES CORP.
2300 Westmoreland St.
Philadelphia 40, Pa.

## Centrifuges, Oil Testing

THE GERIN CORP.
P. O. Box 653
Red Bank, N. J.

## Centrifuse Brake Drums

CAMPBELL, WYANT & CANNON FDRY. CO.
Muskegon 83, Michigan

## Chains, Control

LINK-BELT COMPANY
220 So. Belmont Ave.
Indianapolis 6, Indiana

## Chains, Dual Engine Drive

See also "Dual Engine Chain Drives".

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

## Chains, Power Transmission

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

## Chains, Roller

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

## Chains, Silent

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

## Chains, Timing

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

## Chargers, Battery

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

## Chromium Treated Parts

VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, N. Y.

## Circuit Breakers

BROWN BOVERI CORP.
19 Rector St.
New York 6, N. Y.

## Cleaning Compounds

OAKITE PRODUCTS, INC.
22 Thames Street
New York 6, N. Y.

## Clutch Discs

BURGESS-NORTON MFG. CO.
Geneva, Illinois

THE SNOW-NABSTEDT GEAR CORP.
251 Welton Street
Hamden, Conn.

## Clutches

ROCKFORD CLUTCH DIVN.
BORG-WARNER CORP.
1301 Eighteenth Ave.
Rockford, Illinois

## Combustion, Diesel

LANOVA CORP.
38-15 30th Street
Long Island City 1, N. Y.

## Combustion Indicator

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

## Combustion Systems

LANOVA CORP.
38-15 30th St.
Long Island City 1, N. Y.

## Compression Testers, Diesel Engine

See also "Indicators, Diesel Engine".

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park, Illinois

## Compressors, Air

See also "Air Compressors"; "Starting Units"

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

QUINCY COMPRESSOR CO.
217 Maine Street
Quincy, Illinois

READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

## Compressors, Reciprocating, Air and Gas, All Drives

THE COOPER-BESSEMER CORP.
Mount Vernon, Ohio

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

## Conduit, Wiring—Liquid Tight, Flexible

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

## Connecting Rod Bolts & Nuts

See also "Alloy Steel Bolts & Nuts"; headings under "Nuts" and "Studs".

ERIE BOLT & NUT CO.
1325 Liberty Street
Erie, Pa.

## Connecting Rods

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

## Controls, Automatic Starting

AUTOMATIC SWITCH COMPANY
391 Lakeside Avenue
Orange, New Jersey

SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Illinois

## Controls, Cooling Water

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tenn.

THE POWERS REGULATOR CO.
3410 Oakton St.
Skokie, Illinois

## Controls, Electrical

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

## Controls, Pressure

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tenn.

THE MERCOID CORPORATION
4201 Belmont Avenue
Chicago 41, Illinois

PENN CONTROLS, INC.
Goshen, Indiana

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.

## Controls, Temperature

AMERICAN MOTORS CO.
21 Nevins Avenue
Richmond 5, California

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee

THE MERCOID CORPORATION
4201 Belmont Avenue
Chicago 41, Illinois

PENN CONTROLS, INC.
Goshen, Indiana

THE POWERS REGULATOR CO.
3410 Oakton St.
Skokie, Illinois

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.

## Coolers, Evaporative Type

**See headings under "Evaporators".**

AEROFIN CORP.
410 S. Geddes St.
Syracuse 1, N. Y.

BUFFALO FORGE CO.
473 Broadway
Buffalo, N. Y.

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Illinois

THE TRANE CO.
La Crosse, Wisconsin

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

YOUNG RADIATOR COMPANY
Racine, Wisconsin

## Coolers, Jacket Water

**See also "Exchangers, Heat"; "Water Cooling Equipment"; and headings under "Heat Exchangers".**

AEROFIN CORPORATION
410 S. Geddes St.
Syracuse 1, N. Y.

BUFFALO FORGE CO.
473 Broadway
Buffalo, N. Y.

DAVIS ENGINEERING CORP.
30 Rockefeller Plaza
New York 20, N. Y.

ENGINEERING CONTROLS, INC.
2835 E. Eleventh St.
Los Angeles 23, California

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York

J. F. PRITCHARD & CO.
908 Grand Avenue
Kansas City, Missouri

ROSS HEATER & MFG. CO., INC.
1405 West Avenue
Buffalo 13, N. Y.

THE TRANE CO.
La Crosse, Wisconsin

HENRY VOGT MACHINE CO.
1000 West Ormsby St.
Louisville 10, Ky.

G. WALTER MACHINE CO.
84 Cambridge Avenue
Jersey City 7, N. J.

YOUNG RADIATOR CO.
Racine, Wisconsin

## Coolers, Oil and Water

**See also "Oil Coolers"; "Water Cooling Equipment"; "Exchangers, Heat" and headings under "Heat Exchangers".**

AEROFIN CORPORATION
410 S. Geddes St.
Syracuse 1, N. Y.

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York

J. F. PRITCHARD & CO.
908 Grand Avenue
Kansas City 6, Missouri

ROSS HEATER & MFG. CO., INC.
1405 West Avenue
Buffalo 13, N. Y.

THE TRANE CO.
La Crosse, Wisconsin

HENRY VOGT MACHINE CO.
1000 West Ormsby St.
Louisville 10, Ky.

YOUNG RADIATOR CO.
Racine, Wisconsin

## Cooling Towers

**See also "Spray Towers".**

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

THE MARLEY COMPANY, INC.
Fairfax and Marley Roads
Kansas City 15, Kansas

J. F. PRITCHARD & CO.
908 Grand Ave.
Kansas City 6, Missouri

## Core Oils

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

## Couplings, Chain

LINK-BELT CO.
220 So. Belmont Ave.,
Indianapolis, Ind.

## Couplings, Flexible

DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, N. J.

KOPPERS CO., INC.
Koppers Building
Pittsburgh 19, Pa.

LORD MANUFACTURING CO.
1635 West 12th St.
Erie, Pa.

LOVEJOY FLEXIBLE COUPLING CO.
5009 West Lake Street
Chicago 44, Illinois

THOMAS FLEXIBLE COUPLING CO.
P. O. Box 658
Warren, Pa.

## Couplings, Floating Shaft Type

KOPPERS CO., INC.
Koppers Building
Pittsburgh 19, Pa.

THOMAS FLEXIBLE COUPLING CO.
P. O. Box 658
Warren, Pa.

## Couplings, Hydraulic

AERO-COUPLING CORP.
1051 N. Hollywood Way
Burbank, Calif.

AEROQUIP CORP.
Jackson, Michigan

## Couplings, Self-Aligning

KOPPERS CO., INC.
Koppers Building
Pittsburgh 19, Pa.

THOMAS FLEXIBLE COUPLING CO.
P. O. Box 658
Warren, Pa.

## Couplings, Self-Sealing

AERO-COUPLING CORP.
1051 N. Hollywood Way
Burbank, Calif.

AEROQUIP CORP.
Jackson, Michigan

## Crankshaft Bearings

**See also headings under "Bearings".**

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

## Crankshaft, Machinists

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

WASHINGTON IRON WORKS
Sherman, Texas

## Crankshaft Regrinders

VAN NORMAN CO.
AUTOMOTIVE DIVISION
Springfield 7, Mass.

## Crankshafts

**See also "Cast Crankshafts".**

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

## Crankshafts, Reclaimed by Iron Plating

VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, N. Y.

## Crankshafts, Repairs

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.

METALOCK REPAIR SERVICE, INC.
36-15 48th Avenue
Long Island City 1, N. Y.

ARTHUR TICKLE ENGINEERING WORKS
21 Delevan St.
Brooklyn 31, N. Y.

VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, N. Y.

WASHINGTON IRON WORKS
Sherman, Texas

## Cutting Fluids

SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

## Cutting Oils

GULF OIL CORP.
GULF REFINING CO.
Gulf Building
Pittsburgh 30, Pa.

MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Oklahoma

SHELL OIL CO.
50 West 50th St.
New York 20, N. Y.

SHELL OIL CO.
100 Bush Street
San Francisco 6, Calif.

STANDARD OIL CO. (INDIANA)
910 So. Michigan Avenue
Chicago 80, Ill.

THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

## Cutting Tools, Precision

BROWN & SHARPE MFG. CO.
Providence 1, R. I.

## Cylinder Blocks

CAMPBELL, WYANT & CANNON FOUNDRY CO.
Muskegon 83, Mich.

## Cylinder Boring Bars

VAN NORMAN CO.
AUTOMOTIVE DIVISION
Springfield 7, Mass.

## Cylinder Head Grinders

VAN NORMAN CO.
AUTOMOTIVE DIVISION
Springfield 7, Mass.

## Cylinder Heads

CAMPBELL, WYANT & CANNON FOUNDRY CO.
Muskegon 83, Mich.

HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.

## Cylinder Liners

**See also "Liners, Diesel Cylinder" and "Centrifugally Cast Cylinder Liners".**

PERFECT CIRCLE CORP.
Hagerstown, Indiana

SEALED POWER CORP.
500 Sanford St.
Muskegon 61, Michigan

## Cylinder Oils

MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Oklahoma

## Cylinder Repairs

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

METALOCK REPAIR SERVICE, INC.
36-15 48th Avenue
Long Island City 1, N. Y.

ARTHUR TICKLE ENGINEERING WORKS
21 Delevan St.
Brooklyn 31, N. Y.

VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, N. Y.

WASHINGTON IRON WORKS
Sherman, Texas

## Cylinders, Reclaimed by Iron Plating

VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, N. Y.

## Dampers, Torsional Vibration

SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Indiana

## Detergents

LUBAL, INC.
375 W. Rich St.
Columbus 8, Ohio

OAKITE PRODUCTS, INC.
22 Thames St.
New York 6, N. Y.

STANDARD OIL CO. (INDIANA)
910 So. Michigan Avenue
Chicago 80, Ill.

## Development, Diesel Engine

LANOVA CORP.
38-15 30th Street
Long Island City 1, N. Y.

## Diesel Buses

MACK MFG. CORP.
Empire State Bldg.
New York 1, N. Y.

## Diesel Engine Lubricating Oil

**See also "Lubricating Oils".**

STANDARD OIL CO. OF CALIFORNIA
225 Bush Street
San Francisco, Calif.

THE TEXAS COMPANY
135 East 42nd Street
New York 17, N. Y.

## Diesel Engines, New

**See also "Engines, Diesel, New".**

ENTERPRISE ENGINE & MACHINERY CO.
19th & Florida Streets
San Francisco 10, California

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 S. Main St.
Crystal Lake, Illinois

A. G. SCHOONMAKER, INC.
50 Church Street
New York 7, N. Y.

## Diesel Engines, Reconditioned

**See also "Diesel Repairs" and "Repairs Diesel".**

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

GRIFFIN EQUIPMENT CORP.
880 E. 141 St.
New York 54, N. Y.

METALOCK REPAIR SERVICE, INC.
36-15 48th Avenue
Long Island City 1, N. Y.

NATIONAL METAL AND STEEL CORP.
DIESEL DIVISION
Terminal Island
Los Angeles, California

A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.

WASHINGTON IRON WORKS
Sherman, Texas

## Diesel Fuel Oil

**See also "Automotive Diesel Fuel"; "Fuel Oil, Diesel"; "Oils, Diesel Fuel"; "Motor Fuels".**

SHELL OIL CO.
50 West 50th St.
New York 20, N. Y.

SHELL OIL CO.
100 Bush St.
San Francisco 6 Cal.

SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

STANDARD OIL CO. OF CALIF.
225 Bush Street
San Francisco 20, Calif.

## Diesel Fuel Oil Tar and Carbon Dispersing Agent

LUBAL, INC.
375 West Rich Street
Columbus 8, Ohio

## Diesel Generating Sets

**See also "Auxiliary Diesel Generating Sets"; "Emergency Diesel Generators"; "Emergency Lighting Plants"; "Packaged Generators".**

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, Calif.

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Ill.

GRIFFIN EQUIPMENT CORP.
880 E. 141 St.
New York 54, N. Y.

NATIONAL METAL AND STEEL CORP.
DIESEL DIVISION
Terminal Island
Los Angeles, California

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 S. Main St.
Crystal Lake, Illinois

THE RATHBUN-JONES ENGINEERING CO.
823 Spencer St.
Toledo 1, Ohio

JOHN REINER & CO.
12-12 37th Ave.
Long Island City 1, N. Y.

A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.

STERLING ENGINE CO.
2170 Niagara St.
Buffalo 13, N. Y.

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, California

## Diesel Locomotives

**See also headings under "Locomotives".**

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS CORP.
La Grange, Illinois

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

## Diesel Nozzle Testers

**See also "Nozzle Testers".**

AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.

AUTOMOTIVE PRODUCTS, INC.
1700 S. E. Grand Avenue
Portland 14, Oregon

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Ave.
Cleveland 7, Ohio

KENT MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit, Michigan

KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

## Diesel Railway Generating Sets

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisc.

## Diesel Repairs

**See also "Diesel Engines, Reconditioned". "Repairs Diesel"**

SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.

## Diesel Schools

COMMERCIAL TRADES INSTITUTE
1400 Greenleaf
Chicago 26, Illinois

UTILITIES ENGINEERING INSTITUTE DIESEL DIVISION
2521 Sheffield Avenue
Chicago 14, Ill.

## Diesel Truck-Tractors

MACK MFG. CORP.
Empire State Bldg.
New York 1, N. Y.

## Drills, Portable Electric

SNAP-ON TOOLS CORP.
8064 28th Avenue
Kenosha, Wisconsin

## Drives, Chain

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

## Drives, V-Belt

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

## Dual Engine Chain Drives

**See also "Chain, Dual Engine Drives".**

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

## Dynamometers and Prony Brakes

GENERAL ELECTRIC CO.
One River Road
Schenectady 5, N. Y.

## Emergency Diesel Generators

**See also "Auxiliary Diesel Generator Sets"; "Diesel Generating Sets"; "Emergency Lighting Plants"; "Packaged Generators".**

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.

ELECTRIC MACHINERY MFG. CO.
1331 Tyler Street, N. E.
Minneapolis 13, Minn.

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Illinois

JOHN REINER & CO.
12-12 37th Avenue
Long Island City 1, N. Y.

A. C. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.

## Emergency Lighting Plants

**See also heading above.**

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

GRIFFIN EQUIPMENT CORP.
880 E. 141 St.
New York 54, N. Y.

JOHN REINER & CO.
12-12 37th Ave.
Long Island City 1, N. Y.

STERLING ENGINE CO.
1270 Niagara St.
Buffalo 13, N. Y.

## Engine Cooling System Cleaners

**See also "Exchangers, Heat Materials for for Cleaning"; "Scale Removal" Cleaning Compounds.**

YOUNG RADIATOR COMPANY
Racine, Wisconsin

## Engine Cooling System Rust Preventives

SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

YOUNG RADIATOR COMPANY
Racine, Wisconsin

## Engine Overhaul Tools

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Bldg.
Detroit 2, Michigan

## Engine Mountings

LORD MANUFACTURING CO.
1635 West 12th St.
Erie, Pa.

## Engine Repair Stands

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Bldg.
Detroit 2, Michigan

## Engines, Diesel New

**See also "Diesel Engines, New".**

AMERICAN LOCOMOTIVE CO.
Schenectady 5, New York

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

## Engines, Diesel, New, Used

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

COOPER-BESSEMER CORP.
Mount Vernon, Ohio

NORDBERG MFG. CO.
3073 So. Chase Ave.
Milwaukee 7, Wisconsin

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 S. Main St.
Crystal Lake, Illinois

STERLING ENGINE CO.
1270 Niagara St.
Buffalo 13, N. Y.

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, California

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

## Evaporators, Exhaust Gas

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

## Evaporators, Steam

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

## Exchangers, Heat

**See also "Water Cooling Equipment" and headings under "Coolers" and "Heat Exchangers".**

AEROFIN CORP.
410 S. Geddes St.
Syracuse 1, N. Y.

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

DAVIS ENGINEERING CORP.
30 Rockefeller Plaza
New York 20, N. Y.

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York

ROSS HEATER & MFG. CO., INC.
1405 West Avenue
Buffalo 13, N. Y.

THE TRANE CO.
La Crosse, Wisconsin

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, California

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

YOUNG RADIATOR CO.
Racine, Wisconsin

## Exchangers, Heat, Materials for Cleaning

OAKITE PRODUCTS, INC.
22 Thames Street
New York 6, N. Y.

## Exciters

ELECTRIC MACHINERY MFG. CO.
1331 Tyler St., N. E.
Minneapolis 13, Minn.

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

## Fans, Axial Flow

BUFFALO FORGE CO.
473 Broadway
Buffalo, N. Y.

## Fans, Centrifugal

BUFFALO FORGE CO.
473 Broadway
Buffalo, N. Y.

## Fans, Radiator Cooling

KOPPERS COMPANY, INC.
Koppers Building
Pittsburgh 19, Pa.

SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Indiana

## Filters, Air

**See also "Air Cleaners"; "Air Filters". and Headings under "Breathers".**

A. C. SPARK PLUG DIVN.
GENERAL MOTORS CORP.
1300 N. Dort Highway
Flint 3, Michigan

## Filters, Air, Automatic Self-Cleaned

AMERICAN AIR FILTER CO., INC.
215 Central Avenue
Louisville 8, Ky.

CONTINENTAL AIR FILTERS, INC.
2520 Helm Street
Louisville 1, Ken.
DOLLINGER CORP.
11 Centre Park
Rochester 3, N. Y.

## Filters, Air, Dry Type

AMERICAN AIR FILTER CO., INC.
215 Central Avenue
Louisville 8, Ky.
DOLLINGER CORP.
11 Centre Park
Rochester 3, N. Y.

## Filters, Air, Dry Type (Crankcase)

FRAM CORP.
Providence 16, Rhode Island

## Filters, Air, Ejector, Pre-Cleaner

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul, Minn.

## Filters, Air, Materials for Cleaning

AMERICAN AIR FILTER CO., INC.
215 Central Avenue
Louisville 8, Ky.

## Filters, Air, Oil Bath Type

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
AMERICAN AIR FILTER CO., INC.
215 Central Avenue
Louisville 8, Ky.

## Filters, Air, Open-Screen Type

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
AMERICAN AIR FILTER CO., INC.
215 Central Avenue
Louisville 8, Ky.
DOLLINGER CORP.
11 Centre Park
Rochester 3, N. Y.
DONALDSON COMPANY, INC.
666 Pelham Blvd.
Saint Paul 5, Minn.

## Filters, Air, Panel Type

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
AMERICAN AIR FILTER CO., INC.
215 Central Avenue
Louisville 8, Ky.
CONTINENTAL AIR FILTERS, INC.
2520 Helm Street
Lousiville 1, Kentucky
DOLLINGER CORP.
11 Centre Park
Rochester 3, N. Y.

## Filters, (Centrifugal) Fuel Oil

THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
DOLLINGER CORP.
11 Centre Park
Rochester 3, N. Y.

## Filters (Centrifugal) Lubricating Oil

THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.

## Filters, Fuel Oil

**See also "Oil Filters".**

A. C. SPARK PLUG DIVN.
GENERAL MOTORS CORP.
1300 Dort Highway
Flint 3, Michigan
AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.
C. A. V., DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
COMMERCIAL FILTERS CORP.
18 West Third Street
Boston 27, Mass.
CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.
DOLLINGER CORP.
11 Centre Park
Rochester 3, N. Y.
ENGINE LIFE PRODUCTS CORP.
115 So. Granada Ave.
El Monte, Calif.
FRAM CORP.
Providence 16, Rhode Island
THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
30 Madison Avenue
Lebanon, Indiana
LUBER-FINER, INC.
2514 S. Grand Ave.
Los Angeles 7, Calif.
WILLIAM W. NUGENT & CO., INC.
410 No. Hermitage Ave.
Chicago 22, Ill.
PUROLATER PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, N. J.
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
214 Lamson Street
Syracuse 6, N. Y.
E. A. WILDERMUTH INC.
1102 Atlantic Ave.
Brooklyn 16, N. Y.
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

## Filters, Gasoline

FRAM CORP.
Providence 16, R. I.

## Filters, Lubricating Oil

**See also "Oil Filters".**

A. C. SPARK PLUG DIVN.
GENERAL MOTORS CORP.
1300 N. Dort Highway
Flint 3, Michigan
AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.
COMMERCIAL FILTERS CORP.
18 West Third Street
Boston 27, Mass.
CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.
ENGINE LIFE PRODUCTS CORP.
115 So. Granada Ave.
El Monte, Calif.
FRAM CORP.
Providence 16, Rhode Island
THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
30 Madison Avenue
Lebanon, Indiana
LUBER-FINER, INC.
2514 S. Grand Ave.
Los Angeles 7, Calif.
MICHIANA PRODUCTS CORP.
Michigan City, Indiana
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, N. J.
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
214 Lamson Street
Syracuse 6, N. Y.
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

## Filters, Lubricating Oil, Magnetic

WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

## Filters, Porous Metal

PUROLATOR PRODUCTS, INC.
970 New Brunswick Avenue
Rahway, N. J.

## Filters Silencer, Oil Bath Type

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio.
AMERICAN AIR FILTER CO., INC.
215 Central Avenue
Louisville 8, Ky.

## Fire Extinguishers

WALTER KIDDE & COMPANY, INC.
373 Main Street
Belleville 9, N. J.

## Fittings, Drop Forged Steel

HENRY VOGT MACHINE CO.
1000 West Ormsby St.
Louisville 10, Ky.

## Fittings, Hose

AERO-COUPLING CORP.
1051 N. Hollywood Way
Burbank, Calif.
AEROQUIP CORP.
Jackson, Michigan

## Flexible Connections, Stainless Steel

**See also headings under "Hose" and "Tubing".**

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO. INC.
123 W. 64th St.
New York 23, N. Y.
PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.
7271 Powers Lane
Philadelphia 42, Pa.
ZALLEA BROS.
Taylor & Locust Street
Wilmington, Del.

## Flexible Exhaust Connections

**See also headings under "Hose" and "Tubing".**

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
123 West 64th Street
New York 23, N. Y.
CHICAGO METAL HOSE DIVISION
FLEXONICS CORP.
1315 So. 3rd Ave.
Maywood, Ill.
PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.
7271 Powers Lane
Philadelphia 42, Pa.
ZALLEA BROS.
Taylor & Locust Street
Wilmington, Del.

## Flexible Metal Hose

See also "Hose, Flexible, Metallic".

TITEFLEX, INC.
500 Frelinghuysen Ave.
Newark 5, N. J.

## Flexible Metal Hose, Fuel Oil, Lubricating Oil, Compressed Air & Water

See also headings under "Hose" and "Tubing".

AERO-COUPLING CORP.
1051 N. Hollywood Way
Burbank, California

AEROQUIP CORP.
Jackson, Michigan

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

ATLANTIC METAL HOSE CO., INC.
123 West 64th Street
New York 23, N. Y.

CHICAGO METAL HOSE DIVISION
FLEXONICS CORP.
1315 So. 3rd Ave.
Maywood, Illinois

PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.
7271 Powers Lane
Philadelphia 48, Pa.

ZALLEA BROS.
Taylor & Locust Streets
Wilmington, Del.

## Fluid Drive

AMERICAN BLOWER CORP.
P. O. Box 58—Roosevelt Park Annex
Detroit 32, Michigan

## Forgings, Drop

WYMAN-GORDON COMPANY
GENERAL OFFICE & WORKS, Worcester 1, Mass.
(INGALLS-SHEPARD DIVISION, Harvey, Ill.)
(GRAFTON DIVISION, N. Grafton, Mass.)

## Forgings, Steel

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

## Frequency Controls

BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa

## Fuel Injection Systems, Repair & Service

See also "Injection Systems, Service"; "Service, Injection System".

A & D DIESEL SERVICE, INC.
677 Fourth Avenue
Brooklyn 32, N. Y.

## Fuel Oil Additives

See also "Additives"; "Fuel Oil Treatment, Diesel".

LUBAL, INC.
375 West Rich Street
Columbus 8, Ohio

## Fuel Oil, Diesel

See also "Automotive Diesel Fuel"; "Oils, Diesel Fuels"; "Diesel Fuel Oil".

ASHLAND OIL & REFINING CO.
Ashland, Kentucky

CITIES SERVICE OIL CO.
Sixty Wall Tower
New York 5, N. Y.

GULF OIL CORP.

GULF REFINING CO.
3702 Gulf Building
Pittsburgh 30, Pa.

MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Okla.

SHELL OIL CO.
50 W. 50th St.
New York 20, N. Y.

SHELL OIL CO.
100 Bush St.
San Francisco 6, Calif.

SINCLAIR REFINING CO.
600 Fifth Avenue
New York 20, N. Y.

STANDARD OIL CO. (Indiana)
910 South Michigan Ave.
Chicago 80, Illinois

THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

## Fuel Oil Tar and Carbon Dispersing Agent

LUBAL, INC.
375 West Rich Street
Columbus 8, Ohio

## Fuel Oil Treatment, Diesel

See also "Additives"; "Fuel Oil Additives".

LUBAL, INC.
375 West Rich Street
Columbus 8, Ohio

WILKENING MFG. CO. (PEDRICK)
2000 S. 71st Street
Philadelphia 42, Pa.

## Gages, Air Pressure

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.

## Gages, Draft, Portable Indicating

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

## Gages, Fuel

THE LIQUIDOMETER CORP.
36-24 Skillman Avenue
Long Island City 1, N. Y.

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.

## Gages, Oil Pressure

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Ill.

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.

## Gages, Tank Contents

LIQUIDEPTH INDICATORS, INC.
9 Star Square
Long Island City 1, N. Y.

THE LIQUIDOMETER CORP.
36-24 Skillman Avenue
Long Island City 1, N. Y.

VIKING PUMP COMPANY
Cedar Falls, Iowa

## Gages Temperature

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.

## Gages, Vacuum

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester, N Y.

## Gaskets

THE FITZGERALD MFG. CO.
Torrington, Conn.

VICTOR MFG. & GASKET CO.
5750 West Roosevelt Road
Chicago 50, Ill.

## Gaskets, Asbestos

THE FITZGERALD MFG. CO.
Torrington, Conn.

VICTOR MFG. & GASKET CO.
5750 West Roosevelt Road
Chicago 50, Illinois

## Gaskets, Cork

THE FITZGERALD MFG. CO.
Torrington, Conn.

VICTOR MFG. & GASKET CO.
5750 West Roosevelt Road
Chicago 50, Illinois

## Gaskets, Fibrous

THE FITZGERALD MFG. CO.
Torrington, Conn.

## Gaskets, Metallic

THE FITZGERALD MFG. CO.
Torrington, Conn.

VICTOR MFG. & GASKET CO.
5750 West Roosevelt Road
Chicago 50, Illinois

## Gaskets, Oil and Water

THE FITZGERALD MFG. CO.
Torrington, Conn.

## Gears, Cut

WESTERN GEAR WORKS
417 Ninth Street S.
Seattle, Washington

## Gears, Reduction

CONE-DRIVE GEARS
DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, N. J.

ROCHFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois

THE SNOW-NABSTEDT GEAR CORP.
251 Welton Street
Hamden, Conn.

G. WALTER MACHINE CO.
84 Cambridge Avenue
Jersey City 7, N. J.

WESTERN GEAR WORKS
417 Ninth Strret S.
Seattle, Washington

## Generating Sets, Electric

See also "Diesel Generator Sets"; "Auxiliary Diesel Generating Sets"; "Emergency Diesel "Generators"; "Emergency Lighting Plants"; "Packaged Generators"

DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.

ELECTRIC MACHINERY MFG. CO.
1331 Tyler Street N. E.
Minneapolis 13, Minn.

NORDBERG MFG. CO.
3073 So. Chase Ave.
Milwaukee 7, Wisconsin

JOHN RENER & CO.
12-12 37th Avenue
Long Island City 1, N. Y.

THE UNION DIESEL ENGINE CO.
2121 Diesel Street
Oakland 6, California

## Generators, A. C.

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio

DELCO PRODUCTS DIVN.
GENERAL MOTORS CORP.
329 E. First St.
Dayton 1, Ohio

ELECTRIC MACHINERY MFG. CO.
1331 Tyler St., N.E.
Minneapolis 13, Minn.

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Illinois

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

## Generators, Charging

DELCO-REMY DIV.
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

## Generators, D. C.

AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio

DELCO PRODUCTS DIV.
GENERAL MOTORS CORP.
329 E. First St.
Dayton 1, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Illinois

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

## Generators, Engine Driven

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 West 106th St.
Cleveland 11, Ohio

DELCO PRODUCTS DIVN.
GENERAL MOTORS CORP.
329 E. First St.
Dayton 1, Ohio

DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.

ELECTRIC MACHINERY MFG. CO.
1331 Tyler Street, N. E.
Minneapolis 13, Minn.

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

NATIONAL METAL AND STEEL CORP.
DIESEL DIVISION
Terminal Island
Los Angeles, California

JOHN REINER & CO.
12-12 37th Avenue
Long Island City 1, N. Y.

A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.

STERLING ENGINE CO.
1270 Niagara St.
Buffalo 13, N. Y.

## Governors, Centrifugal

PICKERING GOVERNOR CO. (CHAMPLAIN)
88 Llewllyn Avenue
Bloomfield, N. J.

PIERCE GOVERNOR CO.
1625 Ohio Ave.
Anderson, Indiana

WOODWARD GOVERNOR CO.
5001 N. Second St.
Rockford, Illinois

## Governors, Hydraulic

PICKERING GOVERNOR CO. (CHAMPLAIN)
88 Llewllyn Avenue
Bloomfield, N. J.

PIERCE GOVERNOR CO.
1625 Ohio Ave.
Anderson, Indiana

WOODWARD GOVERNOR CO.
5001 N. Second St.
Rockford, Illinois

## Governors, Overspeed, Engine Shut-Off

PICKERING GOVERNOR CO. (CHAMPLAIN)
88 Llewllyn Avenue
Bloomfield, N. J.

PIERCE GOVERNOR CO.
1625 Ohio Ave.
Anderson, Indiana

SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Ill.

## Greases

**See also "Lubricants"; "Industrial Greases."**

CITIES SERVICE OIL CO.
Sixty Wall Tower
New York 5, N. Y.

GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.

MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Okla.

SHELL OIL CO.
50 W. 50th St.
New York 20, N. Y.

SHELL OIL CO.
100 Bush St.
San Francisco 6, Calif.

SINCLAIR REFINING CO.
600 Fifth Avenue
New York 20, N. Y.

SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

## Grey Iron and Steel Castings

CAMPBELL, WYANT & CANNON FOUNDRY CO.
Muskegon 83, Michigan

## Grinders, Bench

SNAP-ON TOOLS CORP.
8064 28th Avenue
Kenosha, Wisconsin

## Grinders, Crankshaft

VAN NORMAN CO.
AUTOMOTIVE DIVISION
Springfield 7, Mass.

## Hardened and Ground Parts

BURGESS-NORTON MFG. CO.
Geneva, Illinois

## Hardness Testers

LOUIS C. EITZEN CO.
17 W. 60th Street
New York 23, N. Y.

## Heat Exchangers, Air Cooled

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 4, N. Y.

HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport 10, N. Y.

THE MARLEY CO., INC.
Fairfax and Marley Roads
Kansas City 15, Kansas

J. F. PRITCHARD & CO.
908 Grand Ave.
Kansas City 6, Missouri

THE TRANE CO.
La Crosse, Wisconsin

YOUNG RADIATOR CO.
Racine, Wisconsin

## Heat Exchangers, Industrial

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

## Heat Exchangers, Oil and Water Cooling

**See also headings under "Coolers"; "Exchangers, Heat"; "Water Cooling Equipment"; etc.**

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 4, N. Y.

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

DAVIS ENGINEERING CORP.
30 Rockefeller Plaza
New York 20, N. Y.

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, N. Y.

ROSS HEATER & MFG. CO., INC.
1405 West Ave.
Buffalo 13, N. Y.

THE SIMS COMPANY
1402 E. 18th St.
Erie, Pa.

THE TRANE CO.
La Crosse, Wisconsin

HENRY VOGT MACHINE CO.
1000 West Ormsby St.
Louisville 10, Ky.

G. WALTER MACHNE CO.
84 Cambridge Avenue
Jersey City 7, N. J.

YOUNG RADIATOR CO.
Racine, Wisconsin

## Heat Treating, Electric Furnace

BURGESS-NORTON MFG. CO.
Geneva, Illinois

GRAVER TANK & MFG. CO., INC.
East Chicago, Indiana

## Heaters

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

YOUNG RADATOR CO.
Racine, Wisconsin

## Heaters, Cab and Space

THE TRANE COMPANY
La Crosse, Wisconsin

YOUNG RADIATOR CO.
Racine, Wisc.

## Hose, Flexible Assemblies

**See also headings under "Flexible" and "Tubing".**

AERO-COUPLING CORP.
1051 N. Hollywood Way
Burbank, Calif.

AEROQUIP CORP.
Jackson, Michigan

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

ATLANTIC METAL HOSE CO. INC.
123 W. 64th Street
New York 23, N. Y.

ZALLEA BROTHERS
Taylor & Locust Streets
Wilmintgon, Del.

## Hose, Flexible Metallic

**See also headings under "Flexible" and "Tubing".**

AERO-COUPLING CORP.
1051 N. Hollywood Way
Burbank, California

AEROQUIP CORP.
Jackson, Michigan

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

ATLANTIC METAL HOSE CO. INC.
123 W. 64th St.
New York 23, N. Y.

ZALLEA BROTHERS
Taylor & Locust Streets
Wilmington, Del.

### Hose, Metal For Steam, Oil, Compressed Air

See also headings under "Flexible Hose" and "Tubing".

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO. INC.
123 W. 64th Street
New York 23, N. Y.
ZALLEA BROTHERS
Taylor & Locust Streets
Wilmington, Del.

### Hydraulic Couplings

See also "Couplings, Hydraulic"

AMERICAN BLOWER CORP.
P. O. Box 58—Roosevelt Park Annex
Detroit 32, Michigan

### Hydraulic Fluids

SHELL OIL CO.
50 W. 50th St.
New York 20, N. Y.
SHELL OIL CO.
100 Bush St.
San Francisco 6, Calif.
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

### Hydraulic Pumps

See also headings under "Pumps"

BROWNE & SHARPE MFG. CO.
Providence 1, R. I.
GEO. D. ROPER CORP.
160 Blackhawk Park Ave.
Rockford, Illinois

### Hydraulic Torque Converters

WESTERN GEAR WORKS
417 Ninth Street S.
Seattle, Washington

### Indicators, Carbon Dioxide Portable

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

### Indicators, Card-Drawing Type

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

### Indicators, Diesel Engine

See also "Compression Testers, Diesel Engine", and other headings under "Indicators".

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Ave.
Cleveland 7, Ohio
ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Ave.
Chicago 40, Illinois
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park, Illinois

### Indicators, Oxygen, Portable

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

### Indicators, Pressure-Time, Diesel Engine

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.
ELECTRO PRODUCTS LABORATORIES, INC.
4501 No. Ravenswood Ave.
Chicago 40, Illinois
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

### Indicators, Sight Flow

WILLIAM W. NUGENT & CO.
410 N. Hermitage Ave.
Chicago 22, Ill.

### Indicators, Speed

WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Avenue
Newark 5, N. J.

### Induction Heating Equipment

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

### Industrial Engines

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 S. Main St.
Crystal Lake, Illinois

### Industrial Greases

See also "Greases," "Lubricants."

THE TEXAS CO.
135 E. 42 St.
New York 17, N. Y.

### Industrial Oils

See also headings under "Lubricants" and "Greases".

STANDARD OIL CO. OF CALIFORNIA
225 Bush Street
San Francisco, Calif.

### Injection Systems, Fuel

AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
SCINTILLA MAGNETO DIVN.
BENDIX AVIATION CORP.
Sidney, N. Y.

### Injection Systems, Fuel Injector

AMERICAN DIESEL SERVICE
P. O. Box 1092—Station A
Cleveland 2, Ohio
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
SCINTILLA MAGNETO DIVN.
BENDIX AVIATION CORP.
Sidney, N. Y.

### Injection Systems, Service

See also "Fuel Injection Systems, Repair & Service"; Service, Injection System".

A & D DIESEL SERVICE, INC.
677 Fourth Avenue
BROOKLYN 32, N. Y.
SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.
GRIFFIN EQUIPMENT CORP.
880 E. 141 St.
New York 54, N. Y.
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Mich.
E. A. WILDERMUTH
1102 Atlantic Avenue
Brooklyn 16, N. Y.

### Injection Exchange Service

AMERICAN DIESEL SERVICE
P. O. Box 1092—Station A
Cleveland 2, Ohio

### Injector Test Stand

See also "Nozzle Testers"

AUTOMOTIVE PRODUCTS, INC.
1700 Southeast Grand Ave.
Portland 14,, Oregon
BACHRACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

### Inspection, Manufacture and Overhaul, for Defects

MAGNAFLUX CORP.
5900 Northwest Highway
Chicago 31, Illinois

### Intake Silencers—Cleaners, Dry Type

See also "Silencers, Intake".

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul 5, Minnesota

### Intercoolers

See also "Supercharger Intercoolers".

PERFEX CORPORATION
500 West Oklahoma Ave.
Milwaukee 7, Wisconsin

### Laboratory, Diesel Engine

LANOVA CORP.
38-15 30th St.
Long Island City 1, N. Y.

### Liner Plating, Porous Chrome

SPAR-TAN ENGINEERING COMPANY
Western Licensee—Van der Horst Corp.
2445 Enterprise St.
Los Angeles 21, California
VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, New York

### Liners, Diesel Cylinder

See also "Centrifugally Cast Cylinder Liners."

HUNT-SPILLER MFG. CO.
383 Dorchester Ave.
Boston 27, Mass.

### Lock Nuts

COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Conn.

### Locomotives, Diesel

See also headings under "Diesel Locomotives".

DAVENPORT-BESLER CORP.
Davenport Locomotive Works
Davenport, Iowa

### Locomotives, Diesel-Electric

See heading above.

AMERICAN LOCOMOTIVE CO.
Schenectady 5, N. Y.
DAVENPORT-BESLER CORP.
Davenport Locomotive Works
Davenport, Iowa
ELECTRO-MOTIVE DIVN.
GENERAL MOTORS CORP.
La Grange, Illinois
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Illinois
GENERAL ELECTRIC CO.
One River Road
Schenectady 5, N. Y.

### Locomotives, Diesel Mechanical

DAVENPORT-BESLER CORP.
Davenport Locomotive Works
Davenport, Iowa

## Lubricants

See also "Industrial Oils", "Greases", "Industrial Greases"

ASHLAND OIL & REFINNG CO.
Ashland, Kentucky
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Oklahoma
SHELL OIL CO.
50 W. 50th St.
New York 20, N. Y.
SHELL OIL CO.
100 Bush St.
San Francisco 6, Calif.
SINCLAIR REFINING CO.
600 Fifth Avenue
New York 20, N. Y.
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.
WYNN OIL COMPANY
1151 West Fifth Street
Azusa, California

## Lubricating Compound

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

## Lubricating Oil Compound

STANDARD OIL CO. (INDIANA)
910 So. Michigan Avenue
Chicago 80, Ill.

## Lubricating Oils

See also "Diesel Engine Lubricating Oil".

ASHLAND OIL & REFINING CO.
Ashland, Kentucky
CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.
COMMERCE OIL CORP.
445 Park Avenue
New York 22, N. Y.
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Okla.
SHELL OIL CO.
50 W. 50th St.
New York 20, N. Y.
SHELL OIL CO.
100 Bush St.
San Francisco 6, Calif.
SINCLAIR REFINING CO.
600 Fifth Ave.
New York 20, N. Y.
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.
STANDARD OIL CO. OF CALIFORNIA
225 Bush Street
San Francisco, Calif.
STANDARD OIL CO. (INDIANA)
910 South Michigan Ave.
Chicago, Illinois
THE TEXAS CO.
135 E. 42nd St.
New York 17, N. Y.
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

## Lubricators

MADISON KIPP CORP.
Madison, Wis.

## Lubricators, Diesel Traction Motor Suspension Bearing

MILLER-FELPAX CORP.
51 Walnut St.
Winona, Minn.

## Lubricators, Felt Wick

MILLER-FELPAX CORP.
51 Walnut St.
Winona, Minn.

## Lubricators, Force Feed

MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.

## Lubricators, Mechanical

See also "Mechanical Force Feed Oil Systems".

MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.

## Lubricators, Sight Feed

MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.

## Machine Tools, Precision

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
BROWN & SHARPE MFG. CO.
Providence 1, R. I.

## Magnets

AUTOMATIC SWITCH COMPANY
391 Lakeside Ave.
Orange, N. J.

## Manifolds

HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.

## Marine Engine Mountings

LORD MANUFACTURING CO.
1635 West 12th St.
Erie, Pa.

## Marine Engines

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, Calif.
P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 S. Main St.
Crystal Lake, Illinois

## Marine Propeller Shaft Couplings

KOPPERS COMPANY, INC.
Koppers Building
Pittsburgh 19, Pa.

## Marine Reverse & Reduction Gears

THE SNOW-NABSTEDT GEAR CORP.
251 Welton Street
Hamden, Conn.
WESTERN GEAR WORKS
417 Ninth Street S.
Seattle, Washington

## Mechanical Force Feed Oil Systems

See also "Lubricators, Mechanical".

MADISON KIPP CORP.
Madison, Wisconsin

## Metal Spraying & Finishing

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.
ARTHUR TICKLE ENGINEERNG WORKS
21 Delevan Street
Brooklyn 31, N. Y.

## Meter Mounts

LORD MANUFACTURNG CO.
1635 West 12th Street
Erie, Pa.

## Meters, Electrical Indicating

See also "Ammeters"

BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Avenue
Newark 5, N. J.

## Meters, Fuel Oil

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

## Milling Machines

BROWN & SHARPE MFG. CO.
Providence 1, R. I.

## Motor Fuels

See also "Automotive Diesel Fuel"; "Diesel Fuel Oil"; "Fuel Oil, Diesel"; "Oil, Diesel Fuel".

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

## Motor Starting Controllers

ELECTRIC MACHINERY MFG. CO.
1331 Tyler Street N. E.
Minneapolis 13, Minn.

## Motors, Electric, A. C.

ELECTRIC MACHINERY MFG. CO.
1331 Tyler Street N. E.
Minneapolis 13, Minn.

## Motors, Electric, A. C. & D. C.

DELCO PRODUCTS DIVISION
GENERAL MOTORS CORP.
329 East First Street
Dayton 1, Ohio
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

## Motors, Gear

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

## Mountings, Bonded Rubber To Metal, Shear Type

LORD MANUFACTURING CO.
1635 West 12th Street
Erie, Pa.

## Mufflers, Intake & Exhaust

See also headings under "Silencers".

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul 5, Minn.
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

## Mufflers, Spark Arresting

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

## Nozzle Testers

See also "Injector Test Stand".

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

## Nozzles, Spray, Water Cooled

AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.

## Nozzles, Spray, Water Cooling

See also "Spray Nozzles, Water".

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.
BUFFALO FORGE CO.
473 Broadway
Buffalo, N. Y.
THE MARLEY COMPANY, INC.
Fairfax & Marley Roads
Kansas City 15, Kansas
J. F. PRITCHARD & CO.
908 Grand Avenue
Kansas City 6, Mo.

## Nuts, Lock

COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Conn.

## Nuts, Plain & Castle

COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Conn.

## Oil Coolers, Lubricating

See also headings under "Coolers"; and "Heat Exchangers"; "Exchangers, Heat".

AEROFIN CORP.
410 S. Geddes St.
Syracuse 1, N. Y.
DAVIS ENGINEERING CORP.
30 Rockefeller Plaza
New York 20, N. Y.
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport, N. Y.
PERFEX CORP.
500 W. Oklahoma Ave.
Milwaukee 7, Wisconsin
ROSS HEATER & MFG. CO., INC.
1405 West Avenue
Buffalo 13, N. Y.
THE TRANE CO.
La Crosse, Wisconsin
HENRY VOGT MACHINE CO.
1000 West Ormsby St.
Louisville 10, Ky.
YOUNG RADIATOR CO.
Racine, Wisconsin

## Oil Filters

See also headings under "Filters".

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
FRAM CORP.
Providence 16, R. I.
HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
30 Madison Ave.
Lebanon, Indiana
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, N. J.
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
214 Lamson Street
Syracuse 6, N. Y.

## Oil Heaters

DAVIS ENGINEERING CORP.
30 Rockefeller Plaza
New York 20, N. Y.
ROSS HEATER & MFG. CO., INC.
1405 West Avenue
Buffalo 13, N. Y.

## Oiling Systems, Pressure & Gravity Types

WILLIAM W. NUGENT & CO.
410 N. Hermitage Ave.
Chicago 22, Ill.

## Oil Pumps

MADISON KIPP CORP.
Madison, Wisconsin

## Oil Purification Systems, Centrifugal

See also headings under "Centrifugal Purifiers".

THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.

## Oil Purification Systems, Chemical

THE HILLIARD CORP.
120 W. Fourth St.
Elmira, N. Y.

## Oil Purification Systems, Filtering Earth Type

THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
THE HILLIARD CORP.
120 W. Fourth St.
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
30 Madison Avenue
Lebanon, Indiana

## Oil Purification Systems Pressure and Gravity Types

THE HILLIARD CORP.
120 W. Fourth St.
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
30 Madison Avenue
Lebanon, Indiana
WM. W. NUGENT & CO., INC.
410 North Hermitage Ave.
Chicago 22, Illinois
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, New Jersey

## Oil Reclamation Systems

THE HILLIARD CORP.
120 W. Fourth St.
Elmira, N. Y.
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
214 Lamson St.
Syracuse 6, N. Y.

## Oil Seals & Grease Retainers

THE FITZGERALD MFG. CO.
Torrington, Conn.
VICTOR MFG. & GASKET CO
5750 West Roosevelt Road
Chicago, Illinois

## Oil Separators

HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
30 Madison Avenue
Lebanon, Indiana

## Oil Testing Equipment (Engine Room Kits)

THE GERIN CORP.
P. O. Box 653
Red Bank, N. J.

## Oils, Diesel Fuel

See also "Automotive Diesel Fuel"; "Diesel Fuel Oil"; "Fuel Oil, Diesel"; "Motor Fuels".

ASHLAND OIL & REFINING CO.
Ashland, Kentucky
GULF OIL CORPORATION
GULF REFINING COMPANY
3702 Gulf Building
Pittsburgh 30, Pa.
MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Oklahoma
SHELL OIL CO.
50 W. 50th St.
New York 20, N. Y.
SHELL OIL CO.
100 Bush St.
San Francisco 6, Calif.
SINCLAIR REFINING CO.
600 Fifth Avenue
New York 20, N. Y.
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

## Packaged Generators

See also "Diesel Generating Sets"; "Generating Sets Electric"; Auxiliary Diesel Generating Sets"; "Emergency Diesel Generators".

## Emergency Lighting Plants

GENERAL ELECTRIC CO.
One River Road
Schenectady 5, N. Y.

## Packing, Oil Wiper

C. LEE COOK MFG. CO.
76 Beaver Street
New York, N. Y.
DOUBLE SEAL RING CO.
2065 Montgomery St.
Fort Worth, Texas

## Packing, Rod Metallic

C. LEE COOK MFG. CO.
76 Beaver St.
New York, N. Y.
DOUBLE SEAL RING CO.
2065 Montgomery St.
Fort Worth, Texas

## Packing, Sheet

VICTOR MFG. & GASKET CO.
5750 W. Roosevelt Road
Chicago, Ill.

## Packing Sheets, Oil & Water

THE FITZGERALD MFG. CO.
Torrington, Conn.

## Parts, Welded

GRAVER TANK & MFG. CO., INC.
East Chicago, Indiana
WASHINGTON IRON WORKS
Sherman, Texas

## Piston Grinders

VAN NORMAN CO.
AUTOMOTIVE DIVISION
Springfield 7, Mass.

## Piston Pin Bearings

JOHNSON BRONZE CO.
470 S. Mill St.
New Castle, Pa.

## Piston Pin Fitting Machines

VAN NORMAN CO.
AUTOMOBILE DIVISION
Springfield 7, Mass.

## Piston Pins

BURGESS-NORTON MFG. CO.
Geneva, Ill.

## Piston Resizing Machines

WAUSAU MOTOR PARTS CO.
1005 Harrison Blvd.
Wausau, Wisconsin

## Piston Rings

C. LEE COOK MFG. CO.
76 Beaver St.
New York, N. Y.
DOUBLE SEAL RING CO.
2065 Montgomery St.
Fort Worth, Texas
HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.
KOPPERS CO., INC.
Koppers Building
Pittsburgh 19, Pa.
PERFECT CIRCLE CORP.
Hagerstown, Indiana
SAFETY SEAL PISTON RING CO.
P. O. Box 106
Fort Worth, Texas
SEALED POWER CORP.
500 Sanford Street
Muskegon 61, Michigan
WAUSAU MOTOR PARTS CO.
1005 Harrison Blvd.
Wausau, Wisconsin
WILKENING MFG. CO. (PEDRICK)
2000 S. 71st St.
Philadelphia 42, Pa.

## Piston Rings, Sealing

C. LEE COOK MFG. CO.
76 Beaver St.
New York, N. Y.
DOUBLE SEAL RING CO.
2065 Montgomery St.
Fort Worth, Texas
KOPPERS CO. INC.
Koppers Building
Pittsburgh 19, Pa.
SAFETY SEAL PISTON RING CO.
P.O. Box 106
Fort Worth, Texas
WILKENING MFG. CO. (PEDRICK)
2000 S. 71st St.
Philadelphia 42, Pa.

## Pistons, Aluminum Alloy

SEALED POWER CORP.
500 Sanford Street
Muskegon 61, Michigan

## Pistons, Cast Iron

HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.

## Planimeter, Indicator Card

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

## Plating, Porous Chrome

SPAR-TAN ENGINEERING CO.
Western Licensee—Van der Horst Corp.
2445 Enterprise St.
Los Angeles 21, Calif.
VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, New York

## Pliers, Gripping, Cutting

SNAP-ON TOOLS CORP.
8064-28th Avenue
Kenosha, Wisconsin

## Plunger and Bushing Reclamation

AMERICAN DIESEL SERVICE
P. O. Box 1092—Station A
Cleveland 2, Ohio

## Portable Contractors' Power Units

See also other headings this page.

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
WAUKESHA MOTOR CO.
P.O. Box 379
Waukesha, Wisconsin

## Power Plants, Automatically Controlled

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
WAUKESHA MOTOR CO.
P.O. Box 379
Waukesha, Wisconsin

## Power Take-Off Units

ROCKFORD CLUTCH DIV.
BORG-WARNER CORP.
1301 18th Ave.
Rockford, Ill.
THE SNOW-NABSTEDT GEAR CORP.
251 Welton Street
Hamden, Conn.

## Power Units

See also other headings this page.

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
WAUKESHA MOTOR CO.
P.O. Box 379
Waukesha, Wisconsin

## Precision Measuring Devices

BROWN & SHARPE MFG. CO.
Providence 1, R. I.

## Pressure Switches

PENN CONTROLS, INC.
Goshen, Indiana
ROCHESTER MANUFACTURING CO., INC.
101 Rockwood Street
Rochester 10, N. Y.

## Propeller Wheels

FERGUSON PROPELLER & RECONDITIONING CO.
Clinton Grand & 12th Streets
Hoboken, New Jersey

## Pullers, Gear, Wheel, Bushing

SNAP-ON TOOLS CORP.
8064—28th Avenue
Kenosha, Wisconsin

## Pumping Units, Diesel

GRIFFIN EQUIPMENT CORP.
880 E. 141st St.
New York 54, N. Y.
STERLING ENGINE CO.
1270 Niagara Street
Buffalo 13, N. Y.

## Pumps, Automatic Reversing

TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.
VIKING PUMP CO.
Cedar Falls, Iowa

## Pumps, Centrifugal

BROWN & SHARPE MFG. CO.
Providence 1, R. I.
DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, New Jersey
INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

## Pumps, Cooling Water

BROWN & SHARPE MFG. CO.
Providence 1, R. I.
DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, N. J.
INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis, Ind.
VIKING PUMP CO.
Cedar Falls, Iowa
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

## Pumps, Fuel Oil Injection

A & D DIESEL SERVICE, INC.
677 Fourth Avenue
Brooklyn 32, N. Y.
AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, N. Y.
E. A. WILDERMUTH
1102 Atlantic Ave.
Brooklyn 16, N. Y.
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

## Pumps, Fuel Transfer

AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
AMERICAN DIESEL SERVICE
P. O. Box 1092—Station A
Cleveland 2, Ohio
BROWN & SHARPE MFG. CO.
Providence 1, R. I.
DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, New Jersey
GEO. D. ROPER CORP.
160 Blackhawk Park Avenue
Rockford, Ill.
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.
V. KING PUMP CO.
Cedar Falls, Iowa
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

## Pumps, Hydraulic Controls

BROWN & SHARPE MFG. CO.
Providence 1, R. I.
DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, New Jersey
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.
VIKING PUMP CO.
Cedar Falls, Iowa

## Pumps, Injector Testing

C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio

## Pumps, Lubricating Oil

BROWN & SHARPE MFG. CO.
Providence 1, R. I.
DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, New Jersey

MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.
GEO. D. ROPER CORP.
160 Blackhawk Park Avenue
Rockford, Ill.
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.
VIKING PUMP CO.
Cedar Falls, Iowa
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

## Pumps, Oil

DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, New Jersey
GEO. D. ROPER CORP.
160 Blackhawk Park Avenue
Rockford, Ill.
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Indiana
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.
VIKING PUMP CO.
Cedar Falls, Iowa
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

## Pumps, Piston, Plunger Type

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

## Pumps, Rotary Gear Type

BROWN & SHARPE MFG. CO.
Providence 1, R. I.
DE LAVAL STEAM TURBINE CO.
853 Nottingham Way
Trenton 2, N. J.
GEO. D. ROPER CORP.
160 Blackhawk Park Avenue
Rockford, Ill.
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.
VIKING PUMP CO.
Cedar Falls, Iowa
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

## Pumps, Stripped Models

BROWN & SHARPE MFG. CO.
Providence 1, R. I.
GEO. D. ROPER CORP.
160 Blackhawk Park Ave.
Rockford, Illinois
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.
VIKING PUMP CO.
Cedar Falls, Iowa

## Pumps, Vacuum

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.
READ STANDARD CORP.
370 Lexington Avenue
New York 17, N. Y.
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

## Purifiers, Fuel Oil

See also "Reclaimers, Oil"; and headings under "Oil".
THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
FRAM CORP.
Providence 16, R. I.
THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
30 Madison Avenue
Lebanon, Indiana
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, New Jersey

## Purifiers, Industrial Oil

See Heading Above.
THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
THE HILLIARD CORP.
120 W. Fourth St.
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
30 Madison Avenue
Lebanon, Indiana
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, New Jersey

## Purifiers, Lubricating Oil

See also "Reclaimers, Oil"; and headings under "Oil".
THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
FRAM CORP.
Providence 16, R. I.
THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
30 Madison Avenue
Lebanon, Indiana
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, New Jersey

## Purifiers, Oil

See heading above.
THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
FRAM CORP.
Providence 16, R. I.
THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
30 Madison Avenue
Lebanon, Indiana
PUROLATOR PRODUCTS, INC.
970 New Brunswick Avenue
Rahway, New Jersey

## Pychrometers

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

## Pyrometers, Exhaust

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

## Pyrometers, Portable

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

## Radiator Cooling System Treatment

SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.
YOUNG RADIATOR CO.
Racine, Wisconsin

## Radiators, Engine Cooling

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, N. Y.
PERFEX CORP.
500 W. Oklahoma Ave.
Milwaukee 7, Wisconsin
THE TRANE CO.
La Crosse, Wisconsin
YATES-AMERICAN MACHINE CO.
Beloit, Wisconsin
YOUNG RADIATOR CO.
Racine, Wis.

## Rail Car Engines

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
STERLING ENGINE CO.
1270 Niagara St.
Buffalo 13, N. Y.

## Rebabbitting, Centrifugal

SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.

## Reclaimers, Oil

See also headings under "Purifiers" and "Oil".
THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
214 Lamson Street
Syracuse 6, N. Y.

## Regulators, Current & Voltage

See also headings under "Voltage".
AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.
BURLINGTON INSTRUMENT CO.
203 North 3rd St.
Burlington, Iowa
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

## Regulators, Temperature

AMERICAN MOTORS CO.
21 Nevin Avenue
Richmond 5, Calif.
PENN CONTROLS, INC.
Goshen, Indiana
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

## Relays

AUTOMATIC SWITCH CO.
391 Lakeside Ave.
Orange, N. J.
SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois
WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Avenue
Newark 5, New Jersey

## Repairs, Diesel

See also "Diesel Repairs".
SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.

GRIFFIN EQUIPMENT CORP.
880 E. 141 St.
New York 54, N. Y.
METALOCK REPAIR SERVICE, INC.
36-15 48th Avenue
Long Island City 1, N. Y.
ARTHUR TICKLE ENGINEERING WORKS
21 Delevan Street
Brooklyn 31, N. Y.
E. A. WILDERMUTH INC.
1102 Atlantic Ave.
Brooklyn 16, N. Y.

## Rotary Pumps

GEO. D. ROPER CORP.
160 Blackhawk Park Avenue
Rockford, Illinois
VIKING PUMP CO.
Cedar Falls, Iowa
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

## Rotor Blower Service Tools

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

## Rubber Mountings

LORD MANUFACTURING CO.
1635 West 12th Street
Erie, Pa.

## Rust Preventives

**See also "Anti-Rust Compounds"**
ASHLAND OIL & REFINING CO.
Ashland, Kentucky
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
OAKITE PRODUCTS, INC.
22 Thames St.
New York 6, N. Y.
SINCLAIR REFINING CO.
600 Fifth Avenue
New York 20, N. Y.
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.
THE TEXAS COMPANY
135 E. 42nd St.
New York 17, N. Y.
YOUNG RADIATOR CO.
Racine, Wisconsin

## Rust Removers

OAKITE PRODUCTS, INC.
22 Thames St.
New York 6, N. Y.

## Safety Controls, Engine

PENN CONTROLS, INC.
Goshen, Indiana

## Safety Stop Controls

SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Ill.

## Scale Removal

OAKITE PRODUCTS, INC.
22 Thames Street
New York 6, N. Y.

## Scavenging Air Blowers

**See also headings under "Blowers", "Supercharging Blowers", "Turbochargers and Superchargers".**
BROWN BOVERI CORP.
19 Rector Street
New York 6, N. Y.
READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.
ROOTS-CONNERSVILLE BLOWER CORP.
900 W. Mount Street
Connersville, Indiana

## Screw Machine Products

BURGESS-NORTON MFG. CO.
Geneva, Ill.

## Sealing Rings

KOPPERS CO., INC.
Koppers Building
Pittsburgh 19, Pa.

## Seals, Automatic Shaft

SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Ind.

## Self Retaining Nuts

COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Conn.

## Service, Injection Systems

**See also "Injection Systems, Service"; "Fuel Injection Systems"; "Repairs, Diesel"; "Diesel Repairs".**
A & D DIESEL SERVICE, INC.
677 Fourth Avenue
Brooklyn 32, N. Y.
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

## Shock Absorbers

DELCO PRODUCTS DIVISION
GENERAL MOTORS CORP.
329 East First Street
Dayton 1, Ohio

## Silencers, Air Filter, Intake

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.
DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul, Minn.

## Silencers, Exhaust

**See also headings under "Mufflers".**
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.
DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul, Minn.
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

## Silencers, Intake

**See heading above.**
AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

## Smoke Meters, Electrical

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

## Solvents

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

## Solvents, Degreasing

GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Building
Pittsburgh 30, Pa.
OAKITE PRODUCTS, INC.
22 Thames St.
New York 6, N. Y.
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

## Solvents for Petroleum Residues

GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Building
Pittsburgh 30, Pa.
OAKITE PRODUCTS, INC.
22 Thames Street
New York 6, N. Y.
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

## Spark Arrestors

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

## Spark Ignition, Oil Engines

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

## Spark Plugs

THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio

## Special Alloy Steel Cylinder & Main Bearing Studs

**See also "Bolts"; "Alloy Steel Bolts & Nuts"; "Connecting Rods".**
ERIE BOLT & NUT CO.
1325 Liberty St.
Erie, Pa.

## Special Maintenance Tools

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

## Special Tools, Mechanical Gear Box

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

## Speed Reducers and Increasers

THE SNOW-NABSTEDT GEAR CORP.
251 Welton Street
Hamden, Conn.
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

## Spray Nozzles, Fuel Injection

**See also under "Nozzles"; "Valves".**
AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.
SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, N. Y.

## Spray Nozzles, Oil

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

## Spray Nozzles, Water

**See also "Nozzles, Spray, Water Cooling".**
BINKS MANUFACTURING CO.
3114 Carroll Avenue
Chicago 12, Illinois
J. F. PRITCHARD & CO.
908 Grand Ave
Kansas City, Mo.

## Spray Ponds

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.
J. F. PRITCHARD & CO.
908 Grand Avenue
Kansas City 7, Mo.

## Spray Towers

**See also "Cooling Towers".**
BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

THE MARLEY CO. INC.
Fairfax & Marley Roads
Kansas City 15, Kansas
J. F. PRITCHARD & CO.
908 Grand Ave.
Kansas City 6, Mo.

### Starting Batteries, Storage

See also headings under "Batteries".

DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Indiana
ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

### Starting Fluid

SINCLAIR REFINING CO.
600 Fifth Avenue
New York 20, N. Y.

### Starting Motors, Air

INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.

### Starting Motors, Electric

DELCO-REMY DIV.
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Indiana
THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio
E. A. WILDERMUTH INC.
1102 Atlantic Avenue
Brooklyn 16, N. Y.

### Starting Units, Engine Driven Air Compressor

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.
QUINCY COMPRESSOR CO.
217 Maine St.
Quincy, Ill.

### Starting Units, Motor-Driven

QUINCY COMPRESSOR CO.
217 Maine St.
Quincy, Ill.

### Stationary Diesel Engines

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

### Steam Cleaning Equipment

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan
OAKITE PRODUCTS, INC.
22 Thames St.
New York 6, N. Y.

### Strainers, Gasoline and Light Fuel Oil

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
CUNO ENGINEERING CORP.
80 So. Vine Street
Meriden, Conn.

### Strainers, Oil

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
CUNO ENGINEERING CORP.
80 South Vine St.
Meriden, Conn.
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.
PUROLATOR PRODUCTS, INC.
970 New Brunswick Avenue
Rahway, New Jersey

### Strainers, Water

CUNO ENGINEERING CORP.
80 South Vine St.
Meriden, Conn.

### Studs, Carbon

ERIE BOLT & NUT CO.
1325 Liberty St.
Erie, Pa.

### Supercharger Intercoolers

See also "Intercoolers"

HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport, N. Y.
YOUNG RADIATOR CO.
Racine, Wis.

### Supercharging Blowers

See also "Blowers, Scavenging and Supercharging"; "Turbochargers, Superchargers".

BROWN BOVERI CORP.
19 Rector St.
New York 6, N. Y.
READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Ind.

### Switchboards and Instruments

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

### Switches, Electric Starting

DELCO-REMY DIV.
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana

### Switches, Engine Safety

ROCHESTER MFG. CO., INC.
101 Rockwood Street
Rochester 10, N. Y.

### Switches, Solenoid

DELCO-REMY DIV.
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana
SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

### Switches, Starting

DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Indiana
SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

### Switchgear

ELECTRIC MACHINERY & MFG. CO
1331 Tyler St., N.E.
Minneapolis 13, Minn.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

### Synchronizers, Automatic

BURLINGTON INSTRUMENT CO.
203 N. 3d St.
Burlington, Iowa

### Tachometers

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan
HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, N. Y.

### Tachometers, Electrical

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

### Tanks, All Kinds

GRAVER TANK & MFG. CO., INC.
East Chicago, Indiana

### Temperature Recorders

THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

### Temperature Regulators, Cooling Water

AMERICAN MOTORS CO.
21 Nevin Ave.
Richmond, Calif.
FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tenn.
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

### Testers, Battery

ELECTRIC STORAGE BATTERY CO.
19th St. & Allegheny Ave.
Philadelphia 32, Pa.

### Testing Instruments, Electrical

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Ave.
Chicago 40, Ill.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

### Tests, Diesel Engine

LANOVA CORP.
38-15 30th St.
Long Island City 1, N. Y.

### Thermocouples

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

### Thermometers

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.
WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

### Thermometers, Dial Indicating, Distance Type

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tenn.
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

### Thermometers, Dial Indicator

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.
THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio
FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tenn.
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois
ROCHESTER MFG. CO., INC.
101 Rockwood Street
Rochester 10, N. Y.

### Thermometers, Distant Reading, Resistance Type

WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

## Thermometers, Flue Gas

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

## Thermometers, Portable Recording

BACHARACH INDUSTRIAL INSTRUMENT CO
7000 Bennett Street
Pittsburgh 8, Pa.
THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio

## Timing Chains

LINK-BELT CO.
220 S. Belmont Ave.
Indianapolis 6, Ind.

## Tools, Injector & Nozzle Maintenance

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

## Tools, Mechanic's Hand

BROWN & SHARPE MFG. CO.
Providence 1, R. I.
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Bldg.
Detroit 2, Michigan
SNAP-ON TOOLS CORP.
8064 — 28th Ave.
Kenosha, Wis.

## Torque Converter Coolers

PERFEX CORP.
500 W. Oklahoma Ave.
Milwaukee 7, Wisconsin

## Towers, Cooling

See also "Cooling Towers"; "Spray Towers".
J. F. PRITCHARD & CO.
908 Grand Avenue
Kansas City 6, Mo.

## Tubing, Corrugated, Flexible Metallic

See also headings under "Flexible" and Hose".
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
123 W. 64th Street
New York 23, N. Y.
PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.
7271 Powers Lane
Philadelphia 42, Pa.
ZALLEA BROS.
Taylor & Locust Sts.
Wilmington, Del.

## Tubing, Flexible Metal

See heading above.
AERO-COUPLING CORP.
1051 N. Hollywood Way
Burbank, California
AEROQUIP CORP.
Jackson, Michigan
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
123 West 64th Street
New York 23, N. Y.
PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.
7271 Powers Lane
Philadelphia 42, Pa.
ZALLEA BROS.
Taylor & Locust Streets
Wilmington, Delaware

## Tubing, Flexible, Non-Metallic

AERO-COUPLING CORP.
1051 N. Hollywood Way
Burbank, California
AEROQUIP CORP.
Jackson, Michigan

## Tubing, High Pressure

AERO-COUPLING CORP.
1051 N. Hollywood Way
Burbank, California
AEROQUIP CORP.
Jackson, Michigan
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

## Turbochargers

See heading below.
BROWN BOVERI CORP.
19 Rector Street
New York 6, N. Y.

## Turbochargers, Superchargers

See also headings under "Blowers"; "Supercharging Blowers"; "Scavenging Air Blowers".
DR. ALFRED J. BUCHI
Engineering Office
Winterthur, Switzerland
U. S. Office, 520 Munsey Bldg.
Washington 4, D. C.

## Unit Injectors, Fuel Oil

SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, New York

## Valve Grinders

VAN NORMAN CO.
AUTOMOTIVE DIVISION
Springfield 7, Mass.

## Valve Seat Grinders

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

## Valves, Air, Ammonia & Gas

HENRY VOGT MACHINE CO.
1000 West Ormsby St.
Louisville, Kentucky

## Valves, Engine Indicator

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park, Ill.

## Valves, Fuel Spray

See also headings under "Spray" and "Nozzles"
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORP.
Sidney, N. Y.

## Valve Seat Inserts

WAUSAU MOTOR PARTS COMPANY
1005 Harrison Boulevard
Wausau, Wisconsin

## Valves, Packless

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tenn.

## Valves, Safety Cleanout

LIQUIDEPTH INDICATORS, INC.
9 Star Square
Long Island City 1, N. Y.

## Valves, Sight Feed

WILLIAM W. NUGENT & CO.
410 No. Hermitage Avenue
Chicago 22, Ill.

## Valves, Solenoid Operated

AUTOMATIC SWITCH COMPANY
391 Lakeside Ave.
Orange, N. J.
PENN CONTROLS, INC.
Goshen, Indiana

## Valves, Thermostatic

AMERICAN MOTORS CO.
21 Nevin Ave.
Richmond, Calif.
FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tenn.
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

## Valves, Three Way

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.
DAVIS ENGINEERING CORP.
30 Rockefeller Plaza
New York 20, N. Y.

## "Vapor Phase" Cooling System

ENGINEERING CONTROLS CO.
2835 E. 11th St.
Los Angeles 23, Calif.

## Variable Speed Transmissions

ELECTRIC MACHINERY MFG. CO.
1331 Tyler Street N. E.
Minneapolis 13, Minn.
WESTERN GEAR WORKS
417 Ninth St. S.
Seattle, Washington
WORTHINGTON PUMP & MACHINERY CORP.
Harrison, New Jersey

## Vibration Control

THE KORFUND CO., INC.
48-15 32nd Place
Long Island City 1, N. Y.
LORD MANUFACTURING CO.
1635 West 12th Street
Erie, Pa.

## Vibration Eliminators

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Illinois
LORD MANUFACTURING CO.
1635 West 12th Street
Erie, Pa.

## Viscosity Indicating Devices

LOUIS C. EITZEN CO.
17 West 60th Street
New York 23, N. Y.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
THE GERIN CORPORATION
P. O. Box 653
Red Bank, N. J.

## Voltage Controls

DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana
GENERAL ELECTRIC COMPANY
One River Road
Schenectady 5, New York

## Voltage Regulators

AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.
BROWN BOVERI CORP.
19 Rector Street
New York 6, N. Y.
BURLINGTON INSTRUMENT CO.
203 W. 3rd St.
Burlington, Iowa
DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana

ELECTRIC MACHINERY MFG. CO.
1331 Tyler Street, N. E.
Minneapolis 13, Minn.

GENERAL ELECTRIC COMPANY
One River Road
Schenectady 5, New York

## Waste Heat Boilers

**See also "Boilers, Waste Heat"; "Boilers, Exhaust Gas".**

DAVIS ENGINEERING CORP.
30 Rockefeller Plaza
New York 20, N. Y.

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

HENRY VOGT MACHINE CO.
1000 West Ormsby St.
Louisville 10, Ky.

## Waste Heat Recovery Units

DAVIS ENGINEERING CORP.
30 Rockefeller Plaza
New York 20, N. Y.

## Water Cooling Equipment

**See also headings under "Coolers" and "Heat Exchangers"; "Exchangers, Heat".**

AEROFIN CORPORATION
410 S. Geddes St.
Syracuse 1, N. Y.

J. F. PRITCHARD & CO.
908 Grand Avenue
Kansas City 6, Mo.

THE TRANE CO.
La Crosse, Wisconsin

YOUNG RADIATOR CO.
Racine, Wisconsin

## Water Purification Systems

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

## Water Softeners

WORTHINGTON PUMP & MACHINERY CORP.
Harrison, N. J.

## Water Temperature Regulators

**See also "Temperature Regulators, Cooling Water"; "Regulators, Temperature".**

AMERICAN MOTORS CO.
21 Nevin Avenue
Richmond, California

THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

## Welding, Diesel Parts

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.

GRAVER TANK & MFG. CO., INC.
East Chicago, Indiana

ARTHUR TICKLE ENGINEERING WORKS
21 Delevan Street
Brooklyn 31, N. Y.

WASHINGTON IRON WORKS
Sherman, Texas

## Weldments (Steel Bases, Frames, Supporting Structures for Diesels)

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

GRAVER TANK & MFG. CO., INC.
East Chicago, Indiana

## Wrenches

SNAP-ON TOOLS CORP.
8064 — 28th Ave.
Kenosha, Wis.

## Wrenches, Open End, Crowfoot

TUBING APPLIANCE CO.
10321 Anza Avenue
Los Angeles 45, Calif.

## Wrenches, Open End, Ratchet

TUBING APPLIANCE CO.
10321 Anza Avenue
Los Angeles 45, Calif.

## Wrenches, Special, For Diesel

TUBING APPLIANCE CO.
10321 Anza Avenue
Los Angeles 45, Calif.

## Wrenches, Socket

SNAP-ON TOOLS CORP.
8064 — 28th Ave.
Kenosha, Wis.

## Wrenches, Torque

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

SNAP-ON TOOLS CORP.
8064 — 28th Ave.
Kenosha, Wis.

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*Please Remember to Say — —*

"I Saw It In Diesel Power and Diesel Transportation"

# "Conformability" of Oil Rings Is Important

*by Helmuth Braendel*
*Chief Engineer, Wilkening Manufacturing Co.*

**Why is it that an engine with proper clearance and a more than adequate lube oil supply to the liner walls will sometimes show high wear rates or even localized scuffing of pistons and liners? Theoretically, there is enough oil present to provide the necessary films and thus afford protection. An answer to this question, among others, along with what is being done about it, is discussed here.**

*Two-piece oil control ring with the new peripheral abuttment type expander. Actual point of abuttment is visible at rear center: Gaps of two-piece ring in right and left foreground.*

PROPER geometry, clearances, design, and lubrication are basic to the successful functioning of pistons and liners. The same is true of the piston rings which must seal the combustion chamber. Let us assume that all of these are adequate in accordance with commercial practices.

Even under these conditions, some engines may show high wear rates and localized scuffing of the liners and pistons. This has been noted even in cases where the sapply of lube oil to the liners has been more than adequate, which should tend to indicate that the necessary protective oil films were being established.

Knowing that the oil is getting to the proper general areas and that it is of suitable grade and characteristics, how then is it possible to account for this phenomenon? The ring manufacturer is necessarily a partner to any investigation of the causes because of the important role of piston rings in proper cylinder functioning.

## Getting at the Root of the Trouble

While the compression rings have a definite function in controlling oil, the oil control rings have a major responsibility. It is their function to scrape off excess oil while metering a *uniformly thin film* to the cylinder wall and the compression rings for their lubrication. Perhaps the localized nature of the trouble when correlated with the above functional description offers the most valid clue to the trouble.

Most cylinders are subject to some degree of distortion, even when new, due to structural or thermal causes. It is readily apparent that a stiffer inflexible ring operating in a distorted cylinder will not conform to such distortion, with the result that it will pass excessive amounts of oil along such sections of the cylinder as distort outward and will scrape excessively along such sections as protrude inward. The latter areas will, therefore, be too dry.

Sections of the compression rings operating against the heavily-scraped portions of the cylinder wall not only will be insufficiently lubricated, but also will operate at excessively high pressures as they move over the same inwardly bulging areas of the cylinder.

Localized scuffing and heavy wear result. Since excessive amounts of oil may be passed at the same time by the other sections of the cylinder which distort outwardly, it is easily seen that we can have the paradoxical result of obtaining both high oil consumption and excessive wear. In fact, this is experienced very frequently when single-piece, stiff, non-conformable oil control rings are used.

The principle means available to overcome the effect of high spots and localized dry areas in distorted and worn cylinders is to design the oil ring so that it is exceptionally conformable. Such a ring will exert uniform pressure against the cylinder wall regardless of the shape and change of shape of the wall, thereby preventing wear and inducing a very long life while simultaneously reducing the oil consumption to a minimum.

## Conformable Ring Designs

The most successful design of conformable rings for large cylinders, in our opinion, consists of two slotted scraper sections made of cast iron, supplemented by a steel expander. The sections are made very thin radially to render them very flexible and conformable. They are provided with a hooked scraper edge which has the characteristic of practically maintaining the width of the cylinder-contacting land as radial wear takes place.

This is considered a very important design feature. The oil control ability of a ring is directly dependent upon the unit pressure with which it is forced against the cylinder wall. Therefore, on a performance graph it provides a substantially flat or horizontal oil-control characteristic. If the land is so shaped that its width will increase rapidly as radial wear takes place, the ring will have the inherent characteristic of losing oil control as engine hours are accumulated.

The force with which this ring is pressed against the cylinder wall is furnished by an expander designed to give a unit pressure of between 80 and 160 psi. The exact range for each particular engine depends upon the specific engine characteristics.

This type of ring is not only conformable radially but, because of the two-piece design, it is also comfortable axially. If one scraping section is pushed from the cylinder wall, either by the hydrodynamic pressure built up by a very heavy film of oil or by a small irregularity in the cylinder, the top or other section can remain in intimate contact with the wall.

This is not the case with the single-piece ring where the movement of the lower section from the cylinder wall, for instance, will impair the oil control ability of the upper land since they are both part of the same piece.

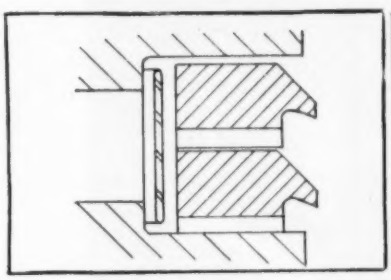
## New Type Expander

There is a further improvement in the conformable oil ring which already has been made available for the more popular large engines in which it has shown excellent performance.

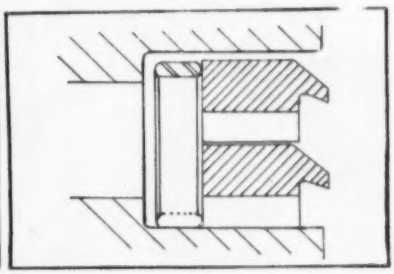
The conventional types of conformable rings employ a humped steel expander which contacts the back of the groove and the I.D. of the ring to furnish the pressure required. In the latest development, this humped-type expander is replaced by a new peripheral abuttment type equalizer which does not contact the back of the groove. The equalizer provides absolutely uniform pressure around the entire circumference of the ring which it contacts continuously all the way around. As a result of this, there is no possibility of the equalizer losing its efficacy because of wear.

It is designed with such low stresses that it takes no set during operation. This means that the equalizer will give the same tension after it has run for thousands of hours as it had before it was placed it in the engine. It is completely open, offering no chance for plugging.

*Once ends butt, further compression of equalizer to fit into oil ring results in uniform deflection and stressing around its entire periphery. Stress reaction produces uniform pressure around ring circumference.*



*Conventional two-piece hook-scraper type oil control ring with hump expander.*



*Similar but more conformable ring with peripheral abuttment equalizer.*

Since the equalizer contacts the ring around the entire circumference with uniform pressure, the cast-iron sections can be made still thinner and consequently more conformable than has been possible with the hump-type expander. It has been found to be a further significant refinement in conformable rings.

## Conformability Can Be the Answer

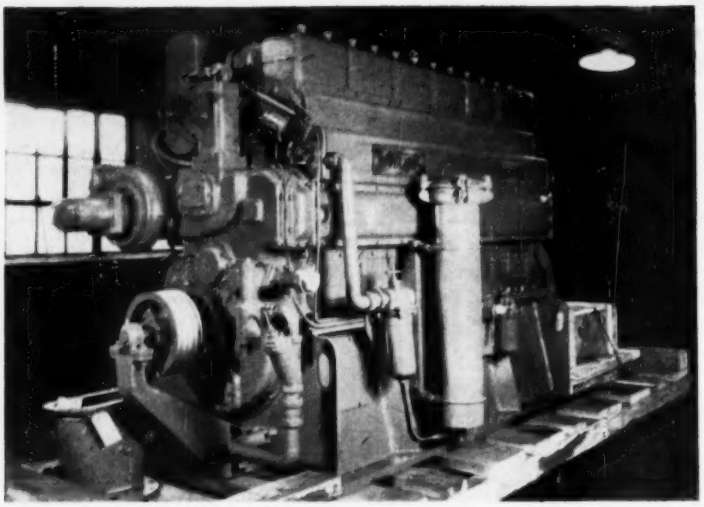
These latest developments in improving conformability of the oil rings will undoubtedly help in obtaining closer agreement of actual functioning of the oil control rings with the ideal situation as previously stated. Not only will proper quantities be metered to the compression rings but it will be *evenly distributed* to all the wearing surfaces.

A point to remember is that the rings in any installation are interdependent. Consequently, they must be combined to work as a team to produce the very best in blowby and oil control so that reduced wear and long life will result. The proper combination can only be developed by long experience with each particular engine. It is, therefore, not practical to give a general recommendation for the incorporation of these rings in all types of engines.

**Do You Need Trained Diesel Men ?**

A card to DIESEL POWER AND DIESEL TRANSPORTATION will bring you our listing.

# Sterling Fuel Consumption Tests Impressive



*One of the engine units mounted on its shipping skid. A completely engineered unit, a minimum of dismantling is required for shipment. At its destination, the unit will be ready to run after simple re-assembly and positioning.*

*Recent tests of two Sterling diesels for incororation in generator sets were supervised by the Navy and produced fuel consumption figures noteworthy for engines of this type. Some details of the engine-generator sets; the engine used; the test results; engine design refinements contributing to the overall efficiency; and some of the builder's ideas regarding economics are discussed.*

**San Francisco Dateline—Two fully-automatic diesel-powered generator sets were recently shipped to Hawaii for installation as stand-by power in a Navy Radio Station. The units, incorporating several unique features, are reported to have shown remarkable fuel economy during Navy-supervised tests.**

**Sterling diesel engines and Westinghouse electrical equipment were used and the units were shipped from the Sterling plant in Buffalo, New York, to the King-Knight Company, engineers and manufacturers of this city, where they were completely assembled with the automatic equipment for starting, paralleling and shut-down.**

**Earlier fuel consumption was confirmed by additional Navy-supervised tests and the completed units were shipped to their overseas destination.**

This is the way that the story might have appeared in the business section of the local press and it represents some of the highlights of general interest. Diesel people want to know more, however, and as in the case of most news stories there is a story behind the story. Let's take a look, particularly at what is behind the statement concerning fuel economy. But first—

## A General Description—

of one engine-generator set will serve to emphasize some of the design features that made them fully-automatic, completely self-contained and functionally efficient.

All of the major components are mounted on a fabricated steel sub-base, insuring accuracy of alignment. All of the necessary systems are incorporated. A full complement of strainers and filters for fuel and lube oil protect the engine. Radiator cooling is used for both cooling water and lube oil. An engine-driven propeller fan circulates the air and the engine's pump circulates the water.

Temperatures are controlled by automatic regulators. When the engine is idle, an average jacket water temperature of 120° F is maintained by thermostatically controlled electric heaters. This feature permits rapid starting and application of the load with no harmful effects on the engine.

Starting is automatic in the event of normal power failure, but since it was desired that starting would not occur during a momentary failure, a 7-sec. delay feature was introduced. In further consideration of the engine, this time was used to advantage by arranging for a motor-driven auxiliary lube oil pump to prime the oil system prior to actual starting.

Instrumentation is complete, including pyrometers. The units are automatically synchronized and go "on-the-line" in only a little more than the introduced delay factor.

The 3-phase 120/208 volt alternator and the exciter are of a completely new Westinghouse design. Elaborate shielding was incorporated and the most painstaking tests conducted to insure the least possibility of radio interference from this source.

### The Engines Used Were—

the latest executions of the 6-cyl. models of the Sterling Viking series, now in regular production. They have 8-in. bores and 9-in. strokes giving a displacement of 2714 cu. in.

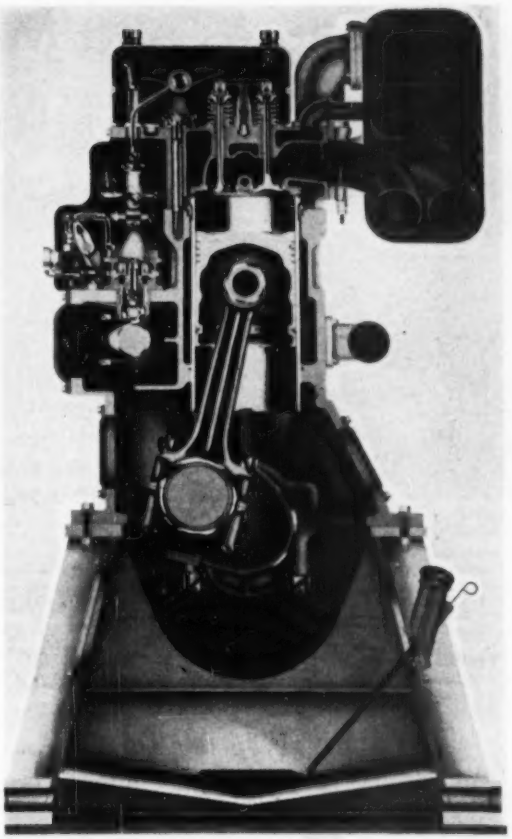
Fitted with turbochargers, they are each rated 585 hp. at 1200 rpm. Incorporated in generator sets, they have a 400 kw. rating.

These engines, along with the very similar 8-cyl. model having the same bore and stroke and an 860 hp. (600 kw.) rating at the same rpm., have been undergoing refinement and testing in the past year and a half. For electrical generation service the welded-steel engine and generator base has been improved and unitary construction insures alignment of the components.

The engine block was completely overhauled; small stress sections removed, important ribs enlarged, and water passages increased in area. Cylinder liners have been completely jacketed all the way to the top to provide better cooling where it is most needed. Lubricating oil is supplied at 60 gpm. by a simplified oil piping system.

Breathing capacity has been increased by enlarging air and exhaust passages. Intake and exhaust headers have been combined in such fashion that the jacket water, cooling the exhaust piping, also provides a degree of intercooling of the scavenging air without taking up the space for the conventional intercooler and its piping.

Maximum exhaust temperatures at full load are approximately 800° F with maximum peak pressures in the cylinders below 1000 psi. Careful attention has been given to balance and torsional vibration with the result that there is practically no vibration up to the 1200 rpm. rated speed.



*General construction is shown in this phantom view. Note how the water jacketing is extended to the top of the liner and the manifold arrangement.*

### Navy Supervised Tests—

were run under conditions specified by them. The first specification was that the rpm. be limited to 900. This imposed a derating on the engine although ratings at the 1200 rpm. speed are considered by the builder to be conservative. However, the frequency requirements of the newly designed electrical equipment was probably the limiting factor.

Further, the fuel consumption tests were to be run at part load, specifically 250 hp., which at the 900 rpm. speed was well below the capacity of the engines. At the end of a 48-hr. run the remarkably low fuel consumption figure of 0.357 lb. per bhp. hr. was obtained.

Later, the units were shipped to King-Knight in San Francisco where they were completely assembled with the equipment for starting, paralleling, and shut-down. Another Navy-supervised test was made with the engines running continuously at a 25 per cent overload. Fuel consumption was 0.358 lb. per bhp. hr. This is an exceptionally low figure for engines of this type and compares very favorably with larger slower speed engines.

### Economics of Diesel Operation—

may require some re-evaluation on the basis of the performance of these comparatively small engines. Taking the fuel consumption figures from the last supervised tests of the completed units, or 0.358 lb. per bhp. hr., it corresponds to approximately 0.48 lb. per kw. hr. Assuming the use of 35 API gravity fuel, it further represents approximately 14.75 kw. hr. per gal.

Figures taken from the last ASME "Report on Oil and Gas Engine Power Costs" would indicate that a good average for all the plants reporting, many burning an equivalent type of fuel oil, would be about 13 kw. hr. per gal. on a gross kw. basis. Some of the newer engines are reporting over 14 kw.hr. per gal. but it can be seen that that the comparison is favorable.

Fuel costs are usually the biggest single expense item in power generation and any reduction in consumption will produce significant savings particularly when long operational periods are involved. This could be an important factor in the use of these engines but, of course, in view of their projected service, is not necessarily a major one in this case.

The builders point out, however, that the cost per kw. hr. should also be integrated with all the factors from housing and installation costs through to the end of their useful life. They further contend that too much stress has been placed on the controversial subject of low speeds versus high speeds without due regard to all the other factors affecting power production costs.

(*Continued on page* 104)

# Causes and Methods of Reducing Excessive Down-time

*LeTourneau Tournadozer powered by a Buda 844 supercharged 161 series diesel.*

*by E. R. Galvin*
*Assistant to the President of the Buda Company*

**Causes of a considerable portion of "down-time" are presented here along with some preventive maintenance and operational suggestions that, although basic, are all too frequently being overlooked. Perhaps some of your present repair bills can be attributed to their neglect.**

TO a very great extent, job completion and operating profits depend upon satisfactory machine performance. For this reason costly and aggravating "excessive" down-time is one of the most frequently discussed subjects in the construction industry today. Also, it is a subject about which there is all too frequently a reluctance to face actual facts and where "passing the buck" is common.

On construction jobs the physical facts are generally available to those who have bid, or who intend to bid on a job. In preparing a bid a contractor usually knows job specifications, job inspection standards, job completion date and penalties for overtime, type of soil or other material involved, haul or travel distances, and grades to be negotiated.

Supplied with this information, the contractor can then decide on machines to be used on the job, determine the availability of operators, set up a maintenance program for the equipment, and determine the availability of parts and mechanical service.

Obviously, the important essentials for a successful and profitable operation are a pre-bid knowledge of the job, organizational capability of handling job, selection of equipment with adequate capacity and power, proper operation and maintenance of equipment, and parts and mechanical service to keep the machines on the job.

A close inspection of the preceding analysis suggests a number of causes for excessive down-time and it is possible to determine where the responsibility for the same rests. The following items are brought forth:

| *Major Causes of Down-Time* | *Responsibility Rests With* |
|---|---|
| 1. Under-powered equipment | Equipment manufacturer |
| 2. Over-loading equipment | Equipment user |
| 3. Neglect of proper maintenance | Equipment user |
| 4. Employment of poor operators | Equipment user |
| 5. Inadequate parts and service | Equipment manufacturer<br>Equipment distributor<br>Accessory manufacturer<br>Accessory distributor |

Although some items are the responsibility of others, the user has an element of control. He has the option of selecting from available equipment that which is adequately designed and powered and for which parts and service are readily available. The balance of the causes of down-time are fundamentally under the direct control of the user.

In regard to under-powered equipment, one contractor with a large fleet of rubber-tired hauling units recently stated that he was just becoming aware of how much such equipment was costing him. Without sufficient power his units were being jerked to pieces. Excessive gear shifting results in constant jerking and damage to engines, clutches, transmissions, rear ends, and tires—all high expense maintenance items—which have cost contractors millions of dollars. For this reason contractors are showing increasing interest in having adequate power in their equipment.

Now let us take a look at some of the things we can do to reduce our maintenance expenses, labor, down-time, and increase service between overhauls. Your diesel engine has been carefully designed and proven in service. Therefore, if you will observe the following precepts at all times, longer satisfactory operation will be assured.

## Keep Engine Within Recommended Speed Range

Your diesel engine will handle its load better if operated within the specified speed range. Close attention should be given to the tachometer, which is installed on all diesel powered trucks. A good driver never permits the tachometer to register below 60 per cent of the governed engine speed, before changing to a lower gear. Therefore, it is of utmost importance that you *do not lug your engine for long periods—use your transmission.*

## Keep Engine Water at Proper Temperature

Engine water should be kept above 165° F at all times. This is necessary not only when hauling, but when idling the engine for long periods of time as well; and is due to the nature

of the diesel cycle. An engine operated cold means sludged oil and clogged-up piston rings. If the radiator thermostat should fail—replace it immediately. Consequently—*beware of cold engine operation.*

## Use a Fuel Oil of the Proper Specifications

Never use a fuel of unknown merit or suitability in your engine. Whenever possible secure a fuel of the same known brands, that positively check to the fuel oil specifications recommended by the engine manufacturer. Handle the fuel with extreme care and keep it clean.

Thorough straining of fuel for the elimination of all water and dirt is essential. Be skeptical of fuel oil contained in drums that may have been out in the weather. Condensation, due to varying outdoor temperatures, will result in sweating of the inside of the fuel drums. This moisture, when mixed with fuel oil, may result in a complete failure of the fuel injection system.

Therefore, do not depend entirely on your fuel oil filter. Use clean, water-free fuel, and clean out or change the fuel oil filter or filter element periodically.

Specifications of a fuel that has proven very satisfactory in Buda truck engines is given here:

| | |
|---|---|
| *Gravity, A.P.I.* | *30-35* |
| *Viscosity, Saybolt* | |
| *Universal @ 100° F* | *35-40* |
| *Flash—°F Min.* | *150° F* |
| *Diesel Index* | *48.5-65.5* |
| *Cetane number* | *46-60* |
| *Pour* | *0° F* |
| *98% Recovery* | *700° F* |
| *Water and sediment* | *Trace* |
| *Ash, Max.* | *.02* |
| *Conradson carbon, Max.* | *.03* |
| *Sulfur, Max.** | *.5* |

**Watch particularly the sulfur content of the fuel you use. It should not exceed specification given.*

Acceptable fuel can be cracked residual, a blend, or a straight run distillate, provided it comes within the scope of the specifications. Fuel should be purchased as a high speed diesel engine fuel and not as a fuel oil, as there will be a difference in cleanliness. So by all means—*buy only fuel specified for your engine and keep it clean.*

*Diesel powered trucks hauling maximum loads up 16 per cent grades at the Bagdad Copper Corporation's mine. With a good maintenance program these trucks are averaging over 6000 hours before an overhaul.*

## Use the Correct Lubricating Oil

Use only approved diesel oils, either those on the Buda Company approved list or reputable oil companies. A good practice is to—*change your oil regularly—do not operate over 100 hours between oil changes.*

## Pay Attention to the Lubricating Oil Filter

Attention to the lubricating oil filter and replacement of the element every oil change will insure you against clogged piston rings, a sludged up engine, and other complications resulting from neglect of this filter. A good maintenance point to remember is—*it is far cheaper in the end to purchase a new filter element when necessary, than to try to use it after it has passed its satisfactory functioning period.*

*Diesel powered Dart truck carries 22 ton loads in the mining operation shown above.*

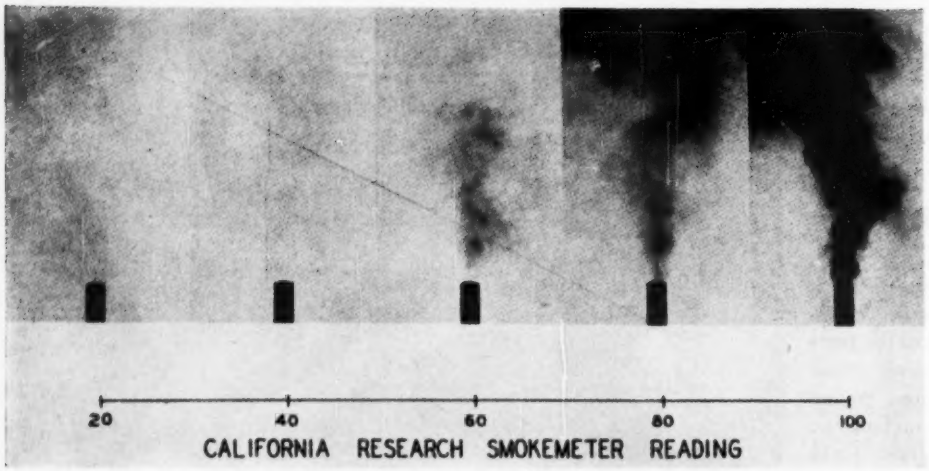
## Give Air Filter Proper Attention

One of the most important parts on your engine is the air filter. If it is kept in proper condition abrasive materials from the air will be prevented from reaching vital parts of your engine. This unit is easy to service, but is too often neglected. Frequency of cleaning will depend on operating conditions, so—*give your engine a break—keep the air filter clean.*

## Check Your Injection Nozzles Periodically

Failure to have your injection nozzles checked periodically, may result in a badly carboned cylinder head, plugged air cells, and stuck piston rings. For top performance—*have injection nozzles checked every 500 hours of engine operation.*

With a pre-bid knowledge of a job, from which the proper selection of properly powered equipment can be made, combined with diligent application of an adequate maintenance program, many dollars of extra profits can be realized. The maintenance suggestions given above are all simple, but much experience in the past has shown that they have not received proper attention.




*Comparison of California Research smokemeter readings and actual smoke density.*

# Power Booster Fuels for Diesels

*by*
*E. J. McLaughlin*
*P. L. Pinotti*
*and*
*H. W. Sigworth**

**In an endeavor to reduce smokey exhausts of highway vehicles, the California Research Corporation has achieved greater efficiency, higher output, and cleaner burning engines by adding part of the engines' fuel into the air intake manifold to obtain a more intimate mixing of the fuel and air.**

WITH more bus and truck operators realizing that efficient operation depends upon high utilization of their equipment and fairly high road speeds, many have increased fuel injection rates above those recommended by the engine builders. Fig. 1 shows the per cent of smoke for various engine speeds at constant power output for both two and four cycle engines, and the importance of keeping the engine in the upper part of the operating range.

Since diesels operate several air-fuel ratios leaner than chemically correct mixtures, even when smoking, significant improvement could be realized if more complete utilization was made of this excess air. It is inherently difficult to achieve good mixing of the fuel and air in the short interval between injection and combustion. Under these conditions the fuel droplets do not have time to vaporize and mix with the air and the resulting hetrogeneous distribution of the fuel promotes smoking. From the above, it does not appear that any reduction in smoke is obtainable with the full diesel cycle.

Complete utilization of the air is not a problem with the conventional gasoline or Otto cycle engines, which operate on the rich side of the chemically correct air fuel ratio with relatively clear exhausts. This demonstrates the value of fuel-air mixing in the carburetor, intake manifold, and during the compression stroke when using volatile fuels. It was, therefore, postulated that the introduction of a portion of the diesel engine's fuel in the form of a volatile supplementary charge into the intake manifold would provide the desired increase in air utilization, improvement in efficiency and reduction of smoke. Such a fuel when used with high speed automotive diesels has been termed a booster fuel.

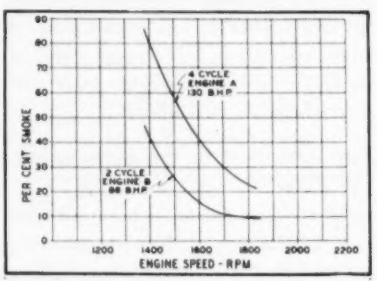
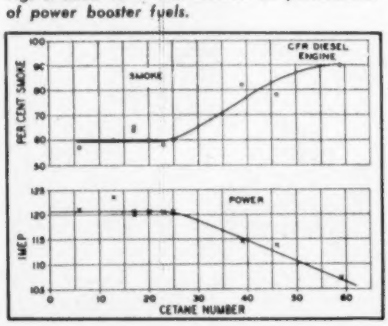



*Fig. 1 Effect of engine speed on smoke at constant power.*

*Fig. 2 Effect of cetane number on performance of power booster fuels.*




## Laboratory Tests

Test work was conducted on a CFR engine belted to run at 1350 rpm. with a Bosch injection system and a "pear-shaped" combustion chamber. When a power booster fuel was added to the air stream an increase in power was noted with some fuels with no increase in smoke. If the total weight of fuel flow (injected plus carbureted) was held constant, both an increase in power and a reduction in smoke were obtained. An appreciable increase in thermal efficiency was also obtained.

In view of the above results, a number of fuels were tested varying in volatility from that of LPG (butane) to fuel heavier than diesel fuel, and in cetane number from almost 100 to below zero. It was found that the volatility of the power booster fuel was not critical so long as it was all

**Abstract of a paper presented at a Society of Automotive Engineers National Fuels and Lubricants Meeting. The authors are all of the California Research Corporation.*

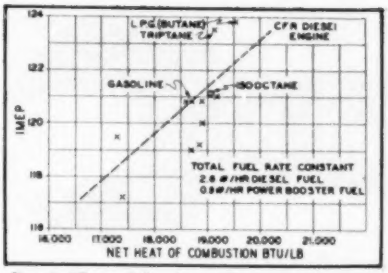
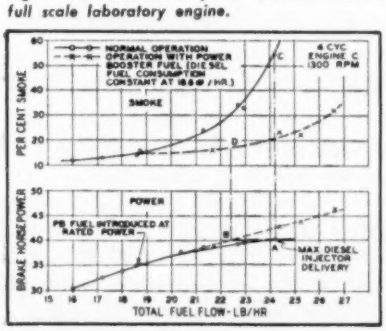



*Fig. 3 Effect of heating value on performance of power booster fuel of less than 25 cetane.*

evaporated when it reached the combustion chamber, and the cetane number was not important if the ignition delay of the carbureted fuel was long enough so that autoignition prior to the normal burning of the injected fuel did not occur. It is believed that if the ignition delay is too short, inflammation of the power booster fuel by autoignition would occur before the injected fuel and air have a chance to mix. This results in rough running, incomplete combustion, loss in power, and increase in exhaust smoke. This is illustrated in Fig. 2, which shows that as the cetane number of power booster fuel is increased above 25, performance becomes poorer. This critical maximum cetane number probably varies for engines of different combustion chamber designs, compression ratios, speeds, altitudes, etc.

Increase in power output was observed to be proportional to net heating value of the power booster fuel, provided that the volatility and cetane number requirements were met. This is shown in Fig. 3. The correlation drawn through the points is the theoretical line assuming constant thermal efficiency. It is indicated from this data that iso-octane, triptane, LPG and commercial gasoline are excellent power boosters. They all have high octane ratings and therefore low cetane numbers with sufficient volatility

*Fig. 4 Performance of power booster fuel in full scale laboratory engine.*


NORMAL OPERATION
OPERATION WITH POWER BOOSTER FUEL (DIESEL FUEL CONSUMPTION CONSTANT AT 188 #/HR.)
6 CYC. ENGINE C 1300 RPM
SMOKE
PER CENT SMOKE
POWER
PB FUEL INTRODUCED AT RATED POWER
MAX DIESEL INJECTOR DELIVERY
BRAKE HORSEPOWER
TOTAL FUEL FLOW-LB/HR

and high heat content required of a good booster fuel.

## Application to Full Scale Engines

Data from a 4-cyl., 4-cycle 312-cu. in. full scale engine is given in Fig. 4. It can be seen that in this particular engine and under these particular conditions, the use of a booster fuel allowed an increase in power over that obtained at the point of maximum pump delivery. At the same power level as that of maximum diesel injector delivery on diesel fuel alone (40 bhp.), the total fuel requirement dropped from 24.2 to 22.5 lbs. per hr. by using a power booster fuel and with a reduction of smoke values from 55 to 17 per cent. This data shows that power output can be increased at constant power with a power booster fuel.

To substantiate the laboratory tests, a tank truck and trailer powered with a 6-cyl., 743 cu. in., 4-cycle, naturally aspirated diesel engine was modified to use power booster fuel, as shown in Fig. 5. Using this test truck, it was demonstrated that the fuel pump setting could be lowered sufficiently at constant power to reduce smoke by about one-half and that, at a constant smoke level, power output could be increased using LPG as the power booster fuel. This is shown in Fig. 6. Liquid fuels were also used in these tests with essentially the same results.

## Power Booster Operation Compared With Other Combustion Cycles

With the diesel cycle all the fuel is injected and spontaneously ignites and burns in a multitude of localized areas shortly after it enters the hot air mass. In the Otto cycle, on the other hand, all the fuel is mixed with the inlet air in combustible proportions before compression. Combustion is initiated by a spark and is complete when a flame front has passed through the fuel-air mixture. The dual fuel cycle is closer to the Otto cycle since, at full load, 80 to 90 per cent of the total fuel is carbureted to the engine in combustible proportions and a small amount of diesel fuel is injected to ignite the charge. In this case most of the flame propagation occurs as in the Otto cycle. In power booster operation the fuel-air mixture carbureted

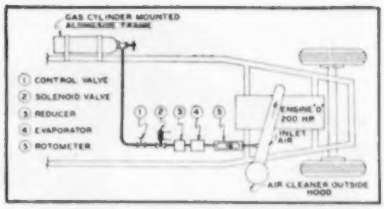



*Fig. 5 Installation of equipment for road test of LPG as power booster fuel.*

to the engine is too lean to support combustion so that ignition and burning is still accomplished as in the diesel cycle, where fuel burns spontaneously after injection.

This feature of power booster operation allows it to utilize diesel engine compression ratios with economical power booster fuels. While most dual fuel engines also use diesel compression ratios, it would be difficult and impractical to store the fuels normally used (natural or sewage gas) with these engines on a road vehicle. The full Otto cycle, of course, cannot use diesel compression ratios on commercial gasoline or LPG, and in addition looses a substantial amount of fuel economy compared to the diesel when operating at part throttle.

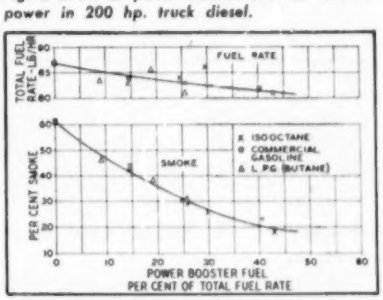
## Economics of Power Booster Operation

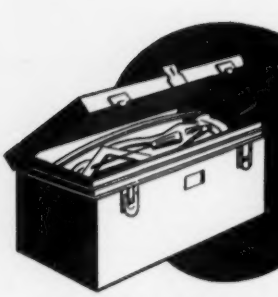
No reduction of engine life is expected from the use of power booster fuels. The slight increase in bmep. is less than in going from naturally aspirated to supercharged operation on the same engine block. Certainly no reduction of engine life would result if power booster fuels were used only to reduce smoke at constant power.

Overall economic considerations are too complex to go into detail here. However, one important generalization concerning the small amount of power booster fuel required to achieve reduced smoke or increased power can

(*Continued on page* 99)

*Fig. 6 Effect of power booster fuel at constant power in 200 hp. truck diesel.*





# Straight from the Tool Box

*This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.*

## Modernizing Old Shop Tools

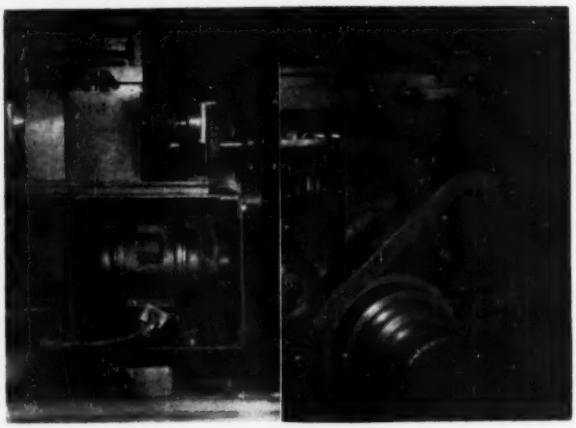
LOUIS REIBEL, POMEROY, OHIO—Some 40 years ago I was fortunate enough to hire in to one of the largest railroads in the country. At that time all of the shop machinery was new and the shop as busy as a bee hive. Long since, the major portion of the shop was moved as part of a centralization plan, and only a dozen or so old machines were left in a smaller shop building. These are utility machines with each job an individual set-up, and no thought of production work.

About five years ago the company moved toward unit drive for all machines. No cut-and-dried plans were handed down. We were just told to get rid of the old line shafting and the belting. Now, after three years of work by the regular force in whatever time could be spared, all machines have been converted. The only equipment supplied by the company that was not built in the shop was some motors and some automobile transmissions.

We harnessed up this equipment to shapers and lathes with the gearing of the transmissions taking the place of the old step pulleys and belting. It was possible to work out the proper speeds. Where the cone pulleys were retained one of the steps was selected for grooving to take the vee-belts used in the drive.

As an example, on the lathes, the whole drive was mounted behind the headstock (I never liked the drives mounted on the headstock). Two transmission levers (shifting forks) were brought out through a control panel at the front of the headstock where they could be seen and reached easily. We also located a push button starter—stop, start and jog—on the panel.

The old machines were given a coat of paint and the men got a thrill not obtained with new machines as they were placed in operation. The individual drive has given them extra power and smoothness. The reverse gear on the shaper has given us an extra speed on the shapers and on the lathes, back-up speed which any operator appreciates.



*At left is unit drive mounted on a LeBlond lathe built in 1909. Spindle shaft pulley and belting are seen. Transmission controls extend to front of machine above headstock. At left is converted shaper also of 1909 vintage. Belts from transmission fit grooves in step of old cone pulley.*

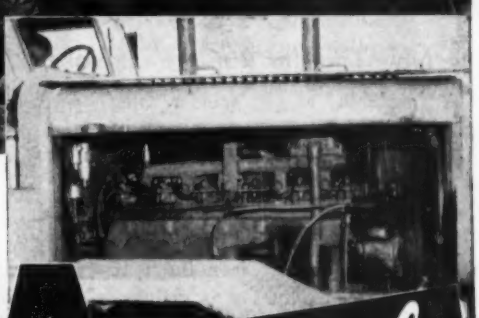
The foreman under whom I served my apprenticeship always said that anybody can run a good machine but it takes a mechanic to do a good job on a poor machine. A good mechanic can also improve old machines and make the best of what he has.

*(Tool modernization and general up-grading is extremely important at this time. If you don't think so, try to buy some new machine tools.—Editor)*

## A Fullers Earth Filter Problem

JACK ATKINSON, CINCINNATI, OHIO—Here is something that I found out about Fullers earth type filters that I thought might be worth passing along. After installation of a bulk-type earth filter in the lube oil setup we found that the refill life was getting progressively shorter as time went on.

We checked and found that when the pressure drop across the filter indicated a new refill, the earth appeared to be hardly discolored and very tightly packed. The tight packing of the earth was thought to be due to engine vibration. We isolated the unit on cork pads and used flexible tubing in place of the original rigid piping. This licked the trouble and we now get three weeks longer life between refills.



# ...PAYLOAD POWER

# WAUKESHA Diesel

● Where hauling is heaviest, and hardest... where turns twist, and grades are steep and stiff—Waukesha Super-Duty Diesels take trucks through, and come back for more. Waukesha has put all this payload performance into its Diesels—by 25 years of Diesel development and research—with many exclusive Waukesha features. The patented spherical combustion chamber controls combustion to meet operation needs—giving the engine lively responsive acceleration, smoothness and complete clean burning for high fuel economy and low maintenance. For the *how* and *why* Diesel details, send for Bulletin 1415.

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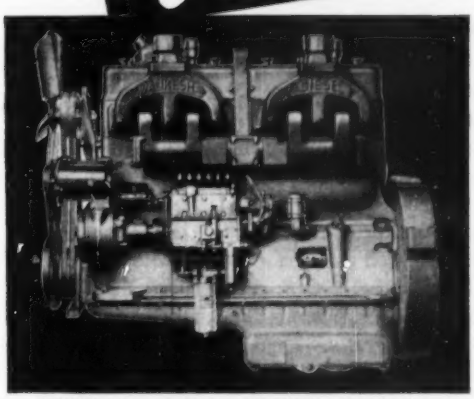
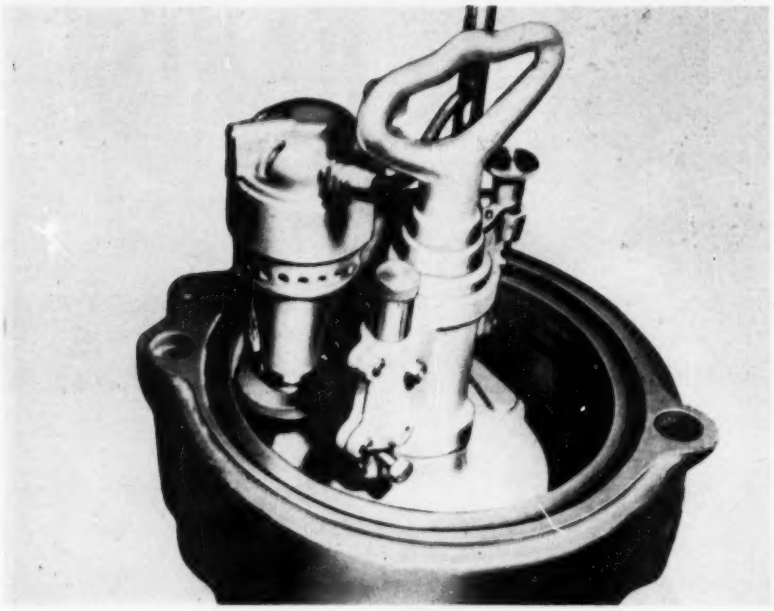


**WAKD Super-Duty DIESEL**—6 cylinders, 6¼-in. bore x 6½-in. stroke, 1197 cu. in. displ.

**WAUKESHA MOTOR COMPANY, WAUKESHA, WIS. • NEW YORK, TULSA, LOS ANGELES**

# New Products



### New Tool for Rapid Removal of Cylinder Liner Ridges

A portable ridge grinder that grinds true to the worn contour of cylinder liners has been developed by the B. K. Sweeney Manufacturing Company.

Ridges are removed from either chrome plated or cast iron liners in less than three minutes it is claimed, and the tool is adjustable to fit any size liner from 7⅞ in. to 16 in. inside diameter. On special order, units can be furnished to fit any size liner up to 25 in. inside diameter.

The new tool, it is said, feathers out the ridge so smoothly that pistons and rings can be readily withdrawn through the top of the cylinders.

A feature of the machine is a built-in wheel dresser that permits wheel dressing without removing the grinder from the cylinder liner. With a total weight of 32 lb. it is easily portable.

### Ratchet Screw Driver

Kipton Industries have announced a new line of palm-grip ratchet screw drivers. These screw drivers have advantages it is claimed in every application where screw drivers are used.

Palm-grip is a ratchet screw driver with 3-position, standard ⅜ in. drive ratchet that can be changed with a flick of a finger. Special design permits direct, even pressure and maximum leverage on every application. Its grip fits into the hand smoothly.

The manufacturer claims that, because of its direct pressure, palm-grip can be used on jobs which are not accessible to other types of tools and that it greatly lessens the possibility of screw burring.

### Multiple Spindle Drilling Machines

Sibley Machine & Foundry Corporation has recently introduced a new design of multiple spindle drilling machine. With three spindles mounted integral to a column, this Model ME-25 is said to be suited to operator efficiency on high volume production.

Features are a 25-in. swing, a variable speed drive from which the exact spindle speed may be obtained for any size drill from 1/8 in. to 1 in., and a large table with coolant trough.

The machine is powered by a 1½-hp. axial air gap motor. Capacity of machine is ¾ in. in steel and 1 in. in cast iron. Distance between spindles is 14⅞ in. Net weight with motors is 2165 lbs.

The wide range of spindle speeds available are obtained by a self-locking speed control. There are no belts to change. A tachometer on front of machine provides accurate reading of speeds. Five options of spindle speeds, each with a 4 to 1 ratio are available, ranging from a low of 206-825 rpm. to a high of 540-2160 rpm., with 3-phase 60-cycle motor. A speed chart on side of machine shows proper speeds for different drill sizes.

### Detergent-Dispersant Motor Oil

Development of a detergent-dispersant, heavy-duty, "engine-conditioning" motor oil, designed to set new standards of automotive engine performance by increasing efficiency and economy of operation through its dual cleaning and conditioning feature, was announced by the Standard Oil Company of Ohio.

The new oil is produced from superior solvent-extracted base stocks and blended with a number of special additives, including foam inhibitors, pour point depressants, V. I. improvers, oxidation inhibitors, rust prevention and detergent-dispersant additives.

Combining the qualities of a high viscosity index oil with the detergent characteristics of supplement-one type oil, plus the protection of a high alkaline reserve factor, Sohio HQD is suitable for use in any type of internal combustion engine where an automotive motor oil is recommended.

### New Steam Detergent Cleaner

Livingstone Engineering Company announces a new steam-jet cleaner, model JC-25. This model is built to operate at pressures up to 200 psi. and is only 16 in. wide and 48 in. long.

The unit is completely self-contained

with space provided to mount a water tank of sufficient capacity for three to four hours of continuous operation. It uses steam from the built-in high pressure boiler. There is said to be no flooding of the working area, no smoke, flames or fire hazard, and no low water danger. The boiler water itself is the electric resistance heating element and if there is no water, no current passes and no steam is generated. The boiler is built under ASME Code, carries National Board stamp, and is Underwriters' Laboratories listed.

It is available for 220, 440, or 550 volts. Rated at 20 kw., the JC-25 under ordinary operating conditions consumes 15-kw. per hour.

### New Small Synchronous Motor

A new small synchronous motor with unusual operating characteristics has been announced by Allis-Chalmers Manufacturing Company.

The motor, operating on the reluctance principle, has no brushes, slip rings, rotating coils or permanent magnet. It can be built to operate continuously at any voltage below 250 volts, either single phase or polyphase, and should interest designers of control systems, instrumentation, and military and industrial equipment.

A typical motor is 4-in. in diameter by 2⅜ in. long, weighs 2.6 lbs., and develops 8 oz.-in. starting torque and 0.8 in. synchronous torque. Simplicity of construction provides high stock resistance and practically no maintenance.

No starting equipment is required. the motor being able to start and pull into step at any frequency from 10 to 400 cycles.

PRECISION FINISHING
interchangeable parts—
lower maintenance costs
Even the heaviest parts of every FULTON DIESEL are craftsman-machined to such close tolerances that they are completely interchangeable. Result:
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• Greater fuel economy — less wear and tear
• Quick, easy replacement saves time and money
WHERE DEPENDABILITY COUNTS, YOU CAN COUNT ON FULTON
FULTON IRON WORKS COMPANY
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### Improved Heat Paint

Improvement in its "heat-rem" H-170 extra high heat resistant aluminum paint to permit air drying in approximately 30 minutes is announced by Speco, Inc.

This new paint is said to mark a departure from ordinary high-heat paints which usually must be baked on and will not air dry. H-170 is capable of withstanding temperatures up to 1700° F, it is claimed. It utilizes a silicone base and is reputed to fuse with surface metal. It forms a bright, elastic finish resistant to moisture, corrosion, mild acids, alkalis and industrial fumes.

The new paint is recommended for use on heat lines, condensors, compressors, ovens, engine heads, mufflers, radiators, exhaust manifolds, etc. The manufacturer states that it makes possible the effective painting of many types of industrial equipment which have previously been regarded as "unpaintable" due to temperature limitations. It is intended for use as a companion product to standard "heat-rem" which is adapted to applications in the temperature range of 100 to 1500° F.

### New Oil Filter and Cooler

A new type of oil-heat-exchanger and oil-clarifier has been announced by the J-B Engineering Co.

The exchanger will be marketed in two sizes which are said to be optimum for the entire diesel field of powered equipment. A third and smaller

# THIS QUICK-CHANGE HEAD REALLY SAVES DOWN TIME and MANPOWER

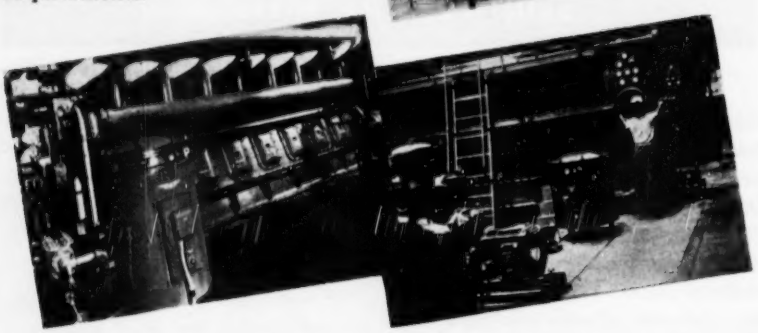
## HOFFMAN FILTERS
for Diesel Fuel and Lube Oils

Simply back off the swing-bolts — turn a hand-wheel, and the cover of your Hoffman Cartridge Filter lifts and turns aside for fast, convenient cartridge changes!

Hoffman builds two series of cartridge filters. One employs Navy 7x18 throwaway units; the other uses 11x18 cartridges, either throwaway or repackable type. Both series provide efficient, dependable removal of contaminants from fuel and lubricating oils — for low cost.

## WRITE FOR BULLETINS

*Full descriptions and specifications are contained in Bulletins A-649 and A-703. Write for them. Illustrated here are three typical Diesel installations protected by Hoffman filters. Get the facts for your requirements.*



FILTRATION DIVISION U.S. HOFFMAN MACHINERY CORPORATION
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CANADIAN PLANT: CANADIAN HOFFMAN MACHINERY CO. LTD., NEWMARKET, ONT.

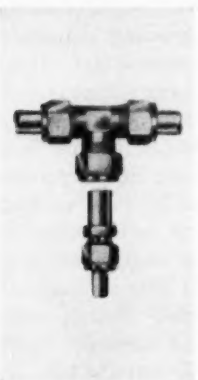

unit is to be made available to owners of light automotive equipment.

Outside surface of the cooler is covered with fins which exchange heat at approximately 5000 Btu. per sq. ft. Filter element is of new design and is claimed to give 50 per cent more service than one of comparable size.

Advantages of the new device claimed by the maker are a cleaner engine, piston rings free of carbonaceous materials, a marked decrease in condensation, a decrease in wear of vital internal engine mechanisms, and a conservation of oil and fuel.

### Tubing Reducer Fitting

The new Swagelok reducer fitting, manufactured by the Crawford Fitting Company, is designed to permit different sizes of tubing to be joined easily. The fitting is made on the same patented principle as other of the company's fittings and consists of a body, two ferrules and a nut. The two ferrules plus the threaded chuck inside the Swagelok nut, clinch tight around the tubing wall and provide a leakproof seal.



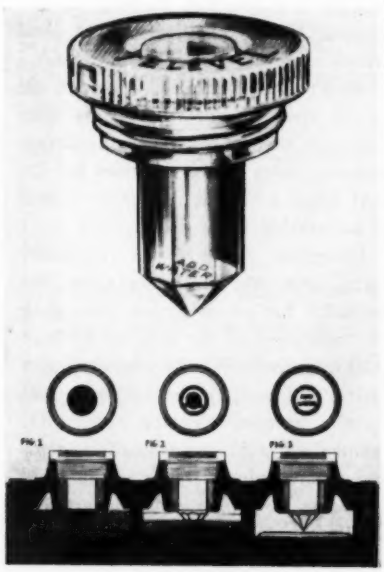
It is not necessary to perform any preparatory steps on the tubing. Simply insert the tubing into the reducer, apply one and one quarter turns to reducer nut and the first assembly is completed. Now insert the reducer into the fitting and apply one and one quarter turns to the fitting nut. The whole assembly is now completed, said to be torque-free and leakproof. In this manner instrumentation and process piping lines may be reduced to the required diameter both on the run and on the branch.

Fittings are available in brass, alu-

minum, steel, stainless steel, and Monel with sizes ranging from ⅛ in to ⅞ in. OD. These reducers are said to hold heavy or thin wall tubing equally well and are made for use with tubing of brass, aluminum, steel, stainless steel, Monel and plastic.

### Battery Water Indicator

Gould storage batteries now feature their "Televel" vent plug development —a clear plastic vent plug that reveals the water level without removing the plug. The illustration shows the prism construction of the lower part of the plastic plug. Note the words "add water" at the top of the prism. The diagrams graphically demonstrate what is seen through the cap of the plug.



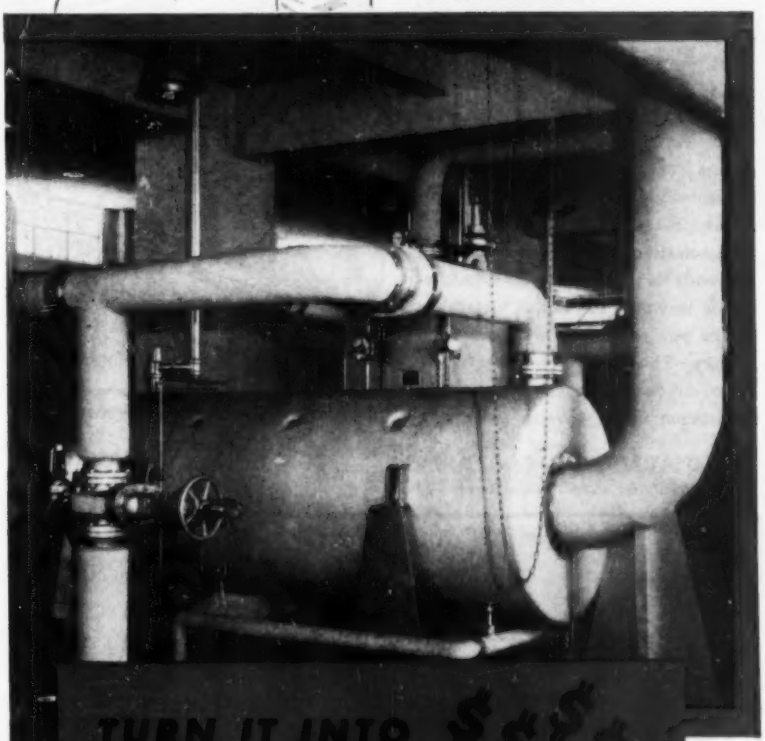
"Televel" vent plugs are used on all Gould batteries with 100 ampere hour capacity or over.

### New Lubricant

A new all-purpose lubricant of the Bentone type, known as "multiplex lubricant" has been developed and placed on the market by Hood Refining Company, manufacturers of a complete line of oils and greases for industrial, automotive, marine and aviation use.

Produced in grades from No. 00 to No. 3, these lubricants are made with a bodying agent that gives them complete stability under all service and storage conditions. They have no melt-

DON'T WASTE EXHAUST HEAT



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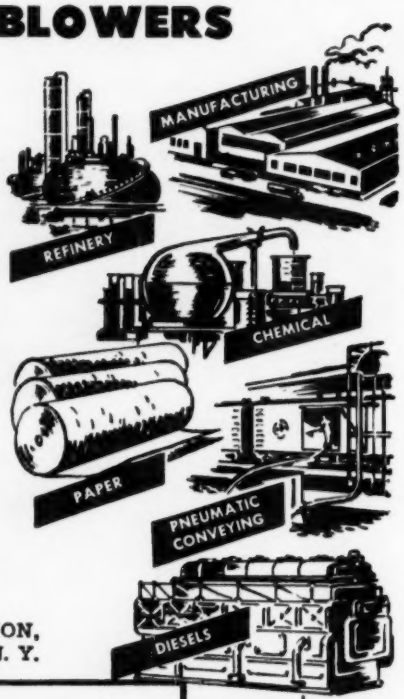


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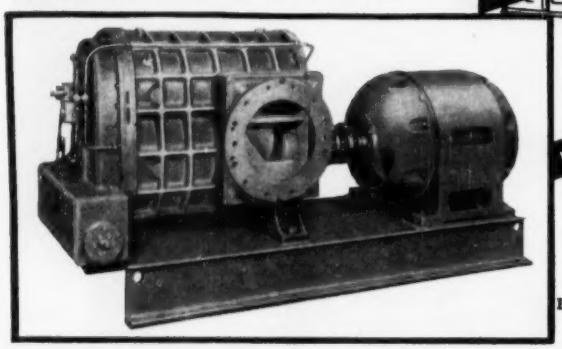

Standardaire 1216B23 Blower to deliver 2850 c.f.m. at 1160 r.p.m.

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ing point and retain their lubricity and adhesive characteristics under all temperature conditions normally encountered. While they are insoluble in water, they will absorb moisture when in service without losing their adhesive or lubricating qualities.

Hood multiplex lubricants contain no metallic soaps or fatty acids and are plastic or pumpable at temperatures from —20° F to +150° F, depending upon the grade.

### Water-Oil Separator Gives Complete Filtering Service

A new water-oil separator featuring simplicity of design, efficient and economical operation, was recently introduced by Honan-Crane. Known as the Houdaille purDry water oil separator, the new device is intended for any industrial oil purification problem where water is a troublesome factor.

Said to reduce water content of oil to an insignificant trace (less than one-tenth of one per cent) the manufacturer states that it provides for the first time, a simple, practical method of separating water from oil.

Designers of the new separator claim that its use eliminates the necessity for changing or discarding oil regardless of the type of contamination encountered. This is attributed to the ability of the separator to perform a complete filtering service for removal of solid contamination, acids and other sludge-forming products of oxidation as well as water separation. Continous operation of the unit on by-pass circulation is said to keep the oil in safe operating condition at all times.

### Extra Strong, High Resistance Electrical Tape

A new heavy-duty plastic electrical tape designed for applications where more-than-average mechanical strength is needed has been announced by Minnesota Mining and Manufacturing Company.

Designated "Scotch" brand electrical tape No. 21, it is recommended for anticorrosion protection for pipes, cables and equipment laid underground where resistance to cuts and abrasion by rocks during back-fill is important.

## *"WHY HAVEN'T I HEARD OF THIS BEFORE?"*

This is what so many diesel operating men ask the first time they see a copy of DIESEL POWER & DIESEL TRANSPORTATION.

And we find, every day, as the diesel field widens, that so many of the men in it, do not know about this valuable magazine—devoted exclusively to diesel.

THEREFORE . . . to expand our service to the diesel industry and all the men in it—and to give our subscribers every possible advantage . . .

you can win a **FREE** copy of one of these VALUABLE REFERENCE VOLUMES.

*****

For every 2 new subscriptions to DIESEL POWER, we will award a copy of the New "FUEL INJECTION SYSTEMS", which sells for $1.50.

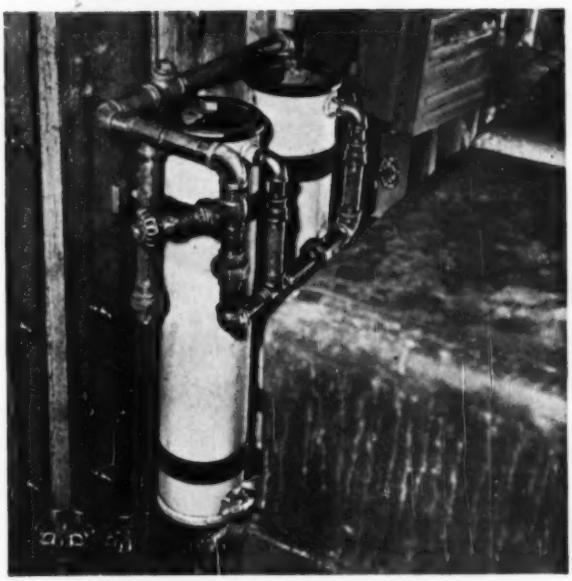
For every 5 new subscriptions to DIESEL POWER, we will award a copy of the "DIESEL ENGINEERING HANDBOOK", Deluxe Edition. This volume covers the entire field of land and marine diesels . . . and sells for $7.50.

*****

Address all subscription orders, correspondence and questions on the above to:

CIRCULATION MANAGER
**DIESEL PUBLICATIONS**
**192 Lexington Avenue, New York 16, N. Y.**





*These Fram Filcron Filters clean about 100 gallons of oil an hour at temperatures of 150-160 degrees for INVADER'S 180 hp Superior Diesel Engine.*

# "I rate FRAM 100% for any diesel owner!"

## *says fishing boat engineer*

Fram Filcron Filter installation guards diesel engine of fisherman *Invader* of New Bedford, Mass., from costly and dangerous power stoppage due to oil contaminants . . . wins praise of boat's engineer, Arnold W. Bower. Without dependable diesel operation, fishing trips are unprofitable . . . and in bad weather uninterrupted power is vital to boat's safety.

Fram Filters contribute to *Invader's* profits by reducing down-time . . . keeping the *Invader* at sea for maximum lengths of time under all conditions. And the cost of Fram protection is small. Mr. Bower states, "replacing one essential bearing would be more than a year's filtering cost. I rate Fram 100% for ANY diesel owner."

### Solve Your Filtering Problems with FRAM!

Whatever your filtering problem—lube or fuel—Fram Filters are the solution. Let Fram's Engineering Department PROVE that Fram Filters remove ALL engine-killing contaminants one micron (.000039") and larger . . . resulting in less down-time, lower operating costs for you. Make your diesels produce at lowest possible cost . . . write TODAY to the Fram Corporation, Providence 16, R. I. *In Canada:* J. C. Adams Co., Ltd., Toronto, Ontario.

**FRAM *Filcron***

**THE MODERN OIL FILTER**

# SAVES YOU DAYS

## WHEN YOU WANT

# TOOLS FAST

When you need hand and bench tools *now*, delivery next month won't help much! To give you service *now*—as well as to help you with your year-around tool problems—Snap-on's 42 factory branch warehouses listed here put a selection of more than 4,000 tools at your elbow. The Snap-on branch near you is staffed with tool specialists—men who know how to help you save production and maintenance time and increase safety by using the right tools. Let us send you copies of the latest Snap-on Industrial and General Catalogs.

**SNAP-ON SERVES INDUSTRY EVERYWHERE THROUGH THESE 42 FACTORY BRANCH WAREHOUSES**

**Albany 5, N. Y.,** 546 Clinton Ave.
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**Brooklyn 25, N. Y.,** 1649 Bedford Ave.
**Buffalo 13, N. Y.,** 628 W. Utica St.
**Charlotte 6, N. C.,** 915 S. Clarkson St.
**Chicago 16, Ill.,** 2023 Michigan Ave.
**Cincinnati 6, Ohio,** 605 E. McMillan St.
**Cleveland 15, Ohio,** 2912 Euclid Ave.
**Dallas 1, Texas,** 2932 Commerce St.
**Denver 3, Colo.,** 1050 Broadway
**Detroit 2, Mich.,** 93 Piquette Ave.
**Fargo, N. Dak.,** 421 N. P. Ave.
**Houston 3, Texas,** 1810 LaBranch St.
**Indianapolis 2, Ind.,** 848 Fort Wayne Ave.
**Jacksonville 6, Fla.,** 1602 Walnut St.
**Kansas City 2, Mo.,** 3635 Main St.
**Los Angeles 14, Calif.,** 1717 W. 6th St.
**Milwaukee 3, Wis.,** 2600 W. State St.
**Minneapolis 3, Minn.,** 1218 Harmon Place
**Newark 6, N. J.,** 823 Sandford Ave.
**New Orleans 13, La.,** 1040 Camp St.
**New York 56, N. Y.,** 397 East 167th St.
**Oklahoma City 3, Okla.,** 901 N. Hudson
**Omaha 2, Nebr.,** 109 S. 24th St.
**Philadelphia 30, Pa.,** 1710 Fairmount Ave.
**Pittsburgh 8, Pa.,** 7007 Kelly St.
**Richmond 20, Va.,** 1617 West Broad St.
**San Francisco 2, Calif.,** 635 Golden Gate
**Seattle 22, Wash.,** 1501 Olive Way
**St. Louis 3, Mo.,** 2647 Washington Blvd.
**Syracuse 3, N. Y.,** 323 Irving Ave.
**Toledo 6, Ohio,** 2932 Monroe St.

**IN CANADA**

**Edmonton, Alberta,** 10232 103rd St.
**London, Ontario,** 111 Mr. Pleasant Ave.
**Moncton, N. B.,** 33 Mechanic St.
**Montreal 15, Que.,** 751 Jean Talon St. W.
**Regina, Sask.,** 2070 Albert St.
**Toronto 17, Ont.,** 130 Laird Drive
**Vancouver, B. C.,** 1043 Davie St.
**Winnipeg, Manitoba,** 238 Garry St.

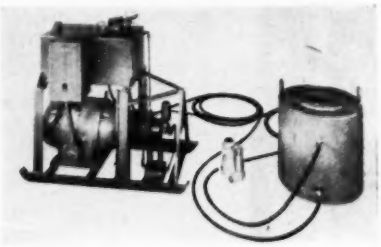
**SNAP-ON TOOLS CORPORATION**
**8064-A 28th Ave., Kenosha, Wis.**


It is also recommended for protecting and insulating cable and high tension leads subject to wear, abrasion and rough handling, and for bus bars carrying high voltage.

The tape has a black, vinyl plastic backing that is 20 mils thick and is available in 36-yard rolls ranging in widths from ¼-in. to 16 in.

### 600-Ton Hydraulic Jack

Said to be the world's largest tonnage hydraulic jack of its type, this is a Simplex "Jenny" center-hole puller of 600-tons capacity made by Templeton, Kenly & Company. Operated by a 10-hp. motor, it is double-acting



for use in large electric plants. Weight of ram is 1750 lbs. Two hand pumps are incorporated. After desired tonnage is run up with motor, extra tonnage can be added gradually with hand pumps. Outside diameter is 22-in. with a height of 21-in. and a 6½-in. travel provided in the 7¾-in. center hole. The "Jenny" center-hole principle eliminates torque. This jack pushes or pulls in a straight line, vertically or horizontally. Size comparison is provided by a standard Jenny shown to the left of its big brother.

### Back Rippers for Bulldozers Utilizes Back-Up Time

Preco back-rippers, which mount on the back of bulldozer moldboards and rip only when the tractor backs up, are now available for angling blade bulldozers, according to an announce-

ment by Preco, Inc., manufacturers of the equipment.

The four back-ripper housings are welded to the under side of the "C" frame on angling blade bulldozers, permitting their use irrespective of the angle of the bladge itself. The teeth float on top of the ground when the tractor moves forward, and automatically dig and rip when the tractor backs up. Thus the dead-head back-up time becomes a profitable operation and enables the blade to make a full load on each forward trip. When desired, the teeth can be locked up out of the way.

### New Freezemeter for Three Anti-Freeze Solutions

A new anti freeze tester has been introduced by the General Scientific Equipment Company. Designated the GS 112, it is designed to give quick, easy readings based on the temperature of the solution being tested. A chart is furnished to give freezing points of three popular anti-freeze solutions. A thermometer is built into the tester for convenience.

### New Lightweight Drills

A new series of small, lightweight portable air drills have recently been announced by Ingersoll-Rand. Outstanding features claimed are: one piece housing providing compact, well balanced, exceptionally short and light weight drill; a more powerful redesigned five-vane air motor, to provide a constantly smooth flow of power; built in automatic lubricator; an advancement in throttle valve design eliminating air leakage; and a specially designed muffler minimizing exhaust noise, an adjustable exhaust deflector permitting the operator to direct exhaust air in any direction. Other construction features include solid-type rotor, special alloy steel cylinders and precision type heavy duty ball bearings.

Known as the OA and OB multi-vane drills, the tools are available in several different speeds for work up to ¼ in. capacity. The units weigh from 2⅜ to 3⅛ lbs. Two styles of handles are available. Attachments, both straight and angle types, are available to adapt the tools to ream-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molecular bonding of

ALUMINUM

and its alloys to

IRON and STEEL

and their alloys provides

1. LIGHTWEIGHT combining the lightness of aluminum and the strength of steel or iron and taking advantage of the machinability of aluminum.

2. HEAT DISSIPATION.

3. BEARING PROPERTIES.

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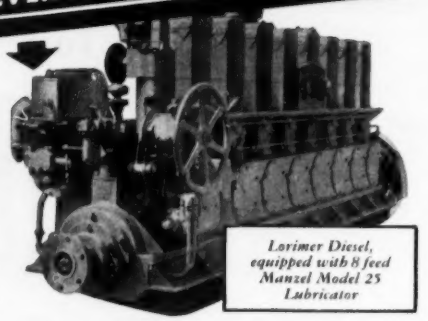
LEADING ENGINES HAVE

Manzel FORCE FEED LUBRICATORS

...A "CREW" of NEVER-FORGETTING OILERS



*Lorimer Diesel, equipped with 8 feed Manzel Model 25 Lubricator*

● With Manzel Lubricators you *know* every wearing point is always receiving exactly the amount of oil it needs. Manzels don't forget or make mistakes. As a result machinery operates efficiently for many more years.

Standard equipment on leading makes of presses, engines, and other machinery, they can also be installed on your present equipment.

We will gladly have a Manzel lubrication engineer submit recommendations without obligation. Just write . . .

*Why it Pays to Select Manzel Lubricators*

- THEY CORRECTLY LUBRICATE EACH POINT
- THEY ARE AUTOMATIC AND TROUBLE-FREE
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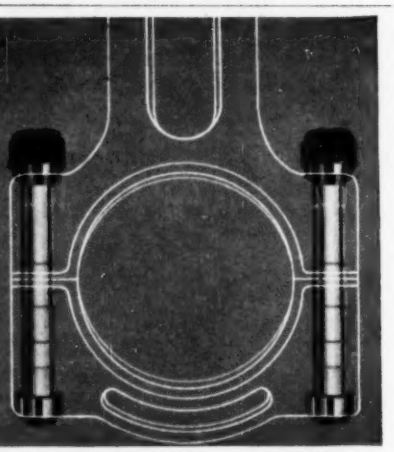
SPECIFY ERIE Connecting Rod BOLTS



Send your specifications for precision bolting to ERIE, headquarters for special bolting since 1913. This long experience with alloys, steels, latest heat treatment and most rigid machining and threading tolerances is at your service. It pays to entrust vital bolting to folks who do this kind of work day in and day out. Hundreds of heavy machinery manufacturers like to do business with ERIE. Try ERIE for *your* next special bolting requirement.

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REPRESENTATION IN PRINCIPAL CITIES

ing, tapping, wire brushing, sanding, screw-driving, nut-running and close quarter drilling.

## New Magnus Oil

The Magnus Chemical Company, Inc., announced recently the development of a new product, Magnus Kling-Oil.

Kling-Oil is a general purpose machinery oil having the feature of metal adhesiveness. It is tacky and clings tenaciously to the moving parts of machinery. It is claimed that it "stays" longer than other oils and thus reduces the number of oilings required, often by as much as five times. The tackiness property is not affected by the rubbing action of machinery. No gumming or build-up is experienced after continued use.

The oil has an SAE-30 viscosity and may be used anywhere that such oils are used and applied by the same methods. Where oil is applied by a circulating system, it may be used satisfactorily, but no advantage should be expected.

## Radiator and Water Cleaner

A device to protect automotive type engines against serious overheating due to faulty cooling systems is the recently introduced Fram Corporation radiator and water cleaner, to fit cars, trucks, buses and tractors.

It is claimed that the new device inhibits rust and corrosion in the cooling system, softens coolant water to stop scale deposits, and filters rust, scale and foreign particles from the coolant, thus guarding the cooling system against severe overheating.

A controlled amount of water flows continuously from the cooling system and enters the cleaner. Water contacts the softening and inhibiting chemicals in a replaceable cartridge, and passes through a filtering media where solids are removed. Filtered, softened water containing soluble inhibitor re-enters the cooling system and circulates throughout, with the result that coolant is free of particles, cannot cause scale deposits, rust or corrosion. The action of the radiator and water cleaner is harmless to anti-freeze and other radiator chemicals.

## New Literature

### Pump Brochure

Construction details on Allis-Chalmers grease-lubricated pedestal-mounted general purpose pumps are given in a new bulletin released by the company.

Included are line cuts, dimension chart, and descriptions.

### Camshaft Bearing Catalog

The Dura-Bond Bearing Company is now releasing a catalog dealing exclusively with camshaft bearings.

This 40-page catalog is devoted to the "all round" cam bearing (as contrasted with split and interlock types) and lists many original equipment numbers for diesel engines, as well as diesel replacements. Large type and liberal cross-referencing make it extremely easy to use.

### GM Booklet

A booklet entitled "What Do GM Diesels Do?" which describes the many uses diesel engines fulfill in our modern economy has been reprinted by Detroit Diesel Engine Division of General Motors.

This booklet is written in rhyme and is illustrated by drawings of locomotives, buses, boats, power shovel, saw mills and many other pieces of essential equipment that are today commonly powered by diesel engines. Copies are suggested as educational pieces for schools, libraries, reception rooms, etc.

### New Metallizing Handbook

A new metallizing handbook has recently been published by Metallizing Engineering Company, Inc. The 250-page text, a completely new work, is illustrated with photographs, diagrams and charts. It provides a coverage of the technical as well as practical aspects of the process. Various methods of surface preparation and the application of metallized coatings for machine element work, for corrosion work, and for many special production jobs, are detailed along with supplementary information.

This includes such miscellaneous applications as the repair of blowholes


TITUSVILLE Diesel CRANKSHAFTS

A Standard Specification

... AMONG AMERICA'S LEADING DIESEL ENGINE BUILDERS FOR MANY YEARS

Precision Tolerances and Finishes as your Requirements demand . . . Turn to Titusville for Engineering and Research Counsel—an organization of master Craftsmen with facilities second to none in the industry.

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STRUTHERS WELLS CORP. *Titusville Forge Division*

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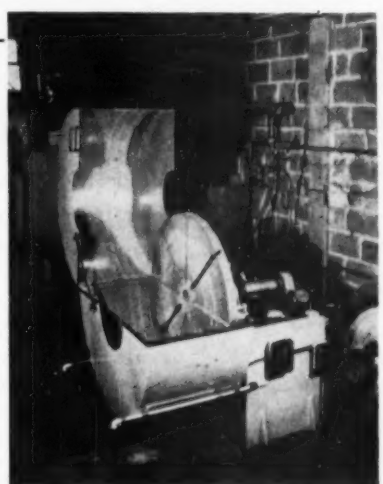
CENTRIFUGAL REBABBITTING

WHEN the job of re-metaling bearings comes up on your maintenance schedule call Sigurd Golten, who will rebabbitt your diesel engine bearings in a fraction of the time usually required.

Through the use of specialized centrifugal rebabbitting apparatus, the Sigurd Golten Machine Corporation can return bearings to service quickly and in "good as new" condition.

Unsolicited testimonials report that bearings rebabbitted by the Golten method outlast by far the usual work of this kind. Our equipment is engineered to handle bearings of all diameters from lightweight high-speed diesels to large slow speed direct drive diesels.



Shown above is part of our specialized rebabbitting machinery in regular operation. The centrifugal table is in vertical, or operating position. During the cast, the safety cover is dropped over the spinning table. Carefully engineered equipment and highly skilled operating personnel assure perfect rebabbitting by the centrifugal method.

SIGURD GOLTEN MACHINE CORPORATION

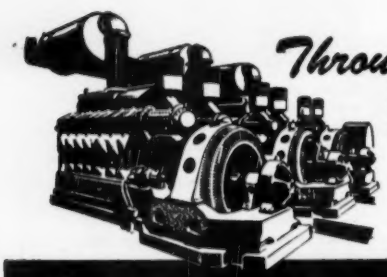
455 Carroll Street • Brooklyn 15, New York • ULster 5-7200

**ASK THE AEROFIN MAN**

*For the Practical Answer to Your Heat-Exchange Problem . . .*

There is a competent Aerofin heat-transfer engineer near you, qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem.

This specialized knowledge is there, ready for you to use to your greatest advantage. Ask the Aerofin man — and be right.



*Throughout the Power Industry—*

**Aerofin units do the job Better, Faster, Cheaper**

AEROFIN CORPORATION 410 South Geddes St. Syracuse 1, N. Y.

*Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.*

in casting, brazing and soldering, glass and ceramics, mass coatings in tumbling barrels, electric circuits, model work, etc. Price of the cloth-bound edition has been set at $3.00 per copy.

### Valve Lubrication Folder

An article reprint entitled "Proper Valve Lubrication . . . A Prerequisite to Good Control" has been issued by the Brown Instruments Division of the Minneapolis-Honeywell Regulator Company.

It discusses the importance of proper valve lubrication in keeping valves operating at peak efficiency. Also covered are the function, proper selection, methods of application and the various types of lubricants in general use. A valve lubricant selection chart is included.

### Railroad Diesel Booklet

A 12-page booklet, "Railroad On-Track Economy", has been issued by the Caterpillar Tractor Company.

It presents pictures and facts in a booklet about on-track equipment powered by "Cat" railroad diesels. Performance is discussed in terms of hours operated, miles run, load-pulling ability, maximum speed, number of trips to the shop and ease of servicing —all with reference to the experiences of specific users. Illustrated stories describe new developments in road and yard switchers, railcars, industrial hauling, and in mobile lifting and maintenance equipment.

### Welding Manual

A fourth edition of "Manual of Welding Design and Engineering" has been issued by the Eutectic Welding Alloys Corporation.

Enlarged to 72 pages, the new edition contains 62 new photographs and 132 new drawings together with data and how-to-do-it articles. The manual is illustrated with application drawings, weld diagrams, tables containing latest information on melting temperatures, tensile strengths, corrosion factors, charts, etc. It gives detailed information on over 100 different low temperature welding alloys for use on cast iron, steel, copper, brass, bronze, aluminum, die cast, stainless, nickel, monel, magnesium, etc., and covers all heating methods.

### Carbon and Graphite Catalog

A new 20-page catalog section describing and illustrating carbon and graphite products is now available from National Carbon Company, a division of Union Carbide and Carbon Corporation.

Products made of carbon and graphite in grades from porous to impervious for applications in the chemical and process, metallurgical, mechanical and electrical fields are fully described. Information is given on sizes and physical characteristics of each product, along with many useful tables.

### Heat Treating Bulletin

A new illustrated bulletin on industrial applications of gas chemistry for heat treating has recently been released by Surface Combustion Corporation.

Exothermic and endothermic type atmosphere generators are described and the gas generation processes schematically diagrammed. Compositions of each gas atmosphere and the respective heat treat process applications are described. In addition, notable examples of furnace design applications for continuous or batch production controlled atmosphere heat treating are presented.

The gas constituents, generator capacities, application data and operating costs for all of the prepared gas atmospheres are tabulated for handy reference in selecting atmospheres.

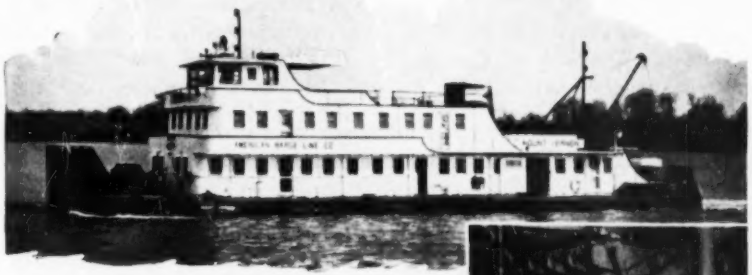
### GM Booklet

General Motors divisions recently began distribution of a new guidebook for use by their dealers in planning their relations with the public.

The booklet, entitled "How GM Dealers Can Make More and Better Friends", is a compilation of case examples, ideas and "thought starters" which have been used successfully by GM divisions and dealers for improving relations with their customers and with the community. Each division will supplement the booklet with programs designed specifically for their own dealers.

The booklet urges the dealers to take an active interest in the affairs of the community. It contains a review of material available to dealers, including films on safe driving and

**Here's low cost *Life Insurance* for diesel engines**



**NUGENT FILTERS for fuel and lube oil**

The amount of protection afforded by fuel and lube oil filters is dependent upon the effectiveness of the filters... and all filters are not equally effective. You'll see what we mean if you'll compare Nugent Filters with any others. By actual test, Nugent Absorbent Oil Filters remove 99.8% of the dirt. Dirt and carbon particles as small as a few microns are removed and prevented from getting to those areas where they can accelerate wear and shorten engine life.

*Above — One of the Nugent Duplex Fuel Oil Filters installed on the "Mount Vernon." Below — A Nugent Lubricating Oil Filter of the type used on the "Mount Vernon."*

Size for size, Nugent Filters offer greater filtering area. In addition, they make possible a choice of full flow or by-pass filtering with the same unit. Recharges are inexpensive and easy to install. Simple piping makes installation no problem.

Write for descriptive literature that shows how to insure the long life of your diesel.

*Three 720 H. P. Cooper — Bessemer Diesel powering the American Barge Line Company's new "Mount Vernon", illustrated above, are equipped with Nugent Filters for fuel and lube oil, helping to assure the owners that they will get all the fine service these engines are designed to give.*

NUGENT TRADE MARK

**Wm. W. *Nugent* & Co., Inc.**

417 N. Hermitage Ave. CHICAGO 22, ILLINOIS

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

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other subjects and literature for public distribution. It reviews other activities, such as the Previews of Progress science show, that are available for public showings in local communities. It also includes a section devoted to instruction of dealer employes in dealing with customers.

### Parker Catalog

A new 76-page catalog of The Parker Appliance Company of Cleveland combines complete data on tube fittings and tube-to-pipe adapters, fabricating equipment, and pertinent data on engineering selection and installation.

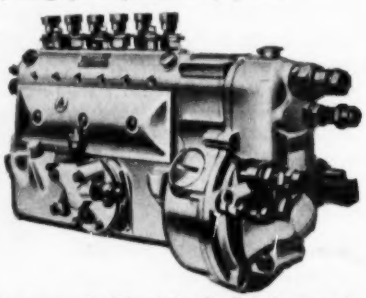
Photos, drawings, and dimensional tables are included for all shapes of the standard 3-piece flared fitting in brass, aluminum, steel, and stainless; the flareless fitting in steel; machined pipe fittings, and tubing, tube clips, tube cutters, benders and flaring tools.

The data section includes six pages of "How-to-do-it" photos and eight pages of valuable selection charts relating tube size to such variables as velocity and flow, differing service conditions, allowable stress, temperatures, and pressures.

***Transport operators all over the world have learnt to trust this sign.***

In any language the letters on the C.A.V. sign stand for first-rate service facilities, maintained by highly-trained craftsmen, using special precision equipment.

Wherever vehicles fitted with C.A.V. Fuel Injection Equipment are exported — whether to Trondheim, Santiago, Hong-Kong or Sydney — there's a service agent or depot to give it the specialist attention needed for such high-precision equipment.



C.A.V. **Fuel Injection and Electrical Equipment**

*Service Depots throughout the World*

C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC., NEW YORK 19, N.Y. Sales Office: 14820 DETROIT AVE., CLEVELAND 7, OHIO


### Cooling System Protection Folder

A new four-page, 2-color folder on the protection of engine cooling systems through proper water treatment has been prepared by Dearborn Chemical Company. It covers the prevention of corrosion of diesel and other internal combustion engines in railroad units, ships and stationary power plants.

It gives complete coverage of the necessity for water treatment, chromate control in closed systems, application of treatment and dosages as well as test methods in determining concentrations.

### Ignition Part Catalog

Sterling International Corporation recently announced the publication of Catalog No. 151 on automotive ignition parts, containing a complete line of contact points, condensers, coils, distributor rotors and caps, voltage regulators, cutouts, brushes, switches, etc. for all popular makes of cars, trucks and buses.

### Stud Welding Manual

An eight page manual prepared to aid designers and production engineers in the solution of fastening problems, has recently been issued by the Nelson Stud Welding Division, Gregory Industries, Inc.

In addition to listing stud specifications and recommended stud selection guides, the manual presents detailed suggestions concerning template design, provisions for accommodating fillet and a table on minimum stud clearance applicable to the portable Nelson stud welding gun.

### Stampings Booklet

A 12-page booklet filled with facts of interest to personnel responsible for the use and purchase of stampings has recently been published by the Stampings Division of the Laminated Shim Company.

The booklet is designed to give

stamping purchasers such information as will assist them in preparing specifications that will insure lowest possible quotations. The special facilities for the stamping service of the company are also dealt with.

### Tool Catalog

A pocket size catalog of their complete center line has recently been published by Ready Tool Company. It contains complete descriptions and illustrations of the anti-friction centers, carbide tipped centers, high speed centers, tool holders, grinding milling dogs and accessories.

### GM Booklet for Suppliers

General Motors recently distributed to present and prospective supplier firms its new booklet "Selling to GM" designed to further improve liaison between GM and the smaller companies which either are now doing business with the corporation or are potential suppliers.

The booklet, it is hoped, will help suppliers find new outlets for their products and services. It contains a directory of the 39 GM manufacturing divisions, with a detailed listing of the civilian and defense products made by each, and an alphabetical listing of all of these products.

The booklet also sets forth the corporation's seven defense policies.

### Rivett Hydraulic Cylinder Catalog

Rivett Lathe & Grinder, Inc. has issued a new catalog section No. 105, illustrating and describing 108 different models of hydraulic cylinders, each in ten bore diameters.

The catalog, in three colors, lists every standard hydraulic cylinder offered in the industry. Working drawings and specifications are furnished for each model and size cylinder, both standard and cushioned types, standard rod and 2:1 over-size rod, single and double end rods, internal and external threads. All information relative to a particular model is shown on one page, facilitating easier layout of circuits by the engineer. Cylinder mountings described are rabett, foot, trunnion, center line, blind end flange, rod end flange, and clevis, in 2- to 10-in. bore diameters, with strokes up to 96-in.

### *Power Booster Fuels*

(*Continued from page* 83)

be made. For example, if 60 per cent of the fuel on a given trip were consumed at full throttle, of which 25 per cent were power booster fuel, the whole trip would require only 15 per cent power booster fuel. Since faster deliveries and decreased driving time can be realized if the booster fuel is used to increase power, and lower maintenance and less air pollution can be effected if the carbureted fuel is used to reduce smoke, it is believed that the direct cost of cargo movement can be lowered by this means.

Cost of vehicle fuel system modifications for a 4-cycle engine exclusive of fuel container and labor is estimated to be about $130 for LPG and $50 for gasoline installations.

Power booster fuels represent a valuable addition to diesel engine operation. They can be used to increase power without increasing smoke or to reduce smoke without reducing power. This can be done by using common fuels now in wide distribution, and minor changes to present equipment.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ROCKFORD CLUTCHES

# Field Notes

## Marion Introduces 10 Cubic Yard Shovel

Described as the world's largest and most powerful shovel is a 10 cubic yard unit recently introduced by the Marion Power Shovel Company.

Known as the Marion 191-M, the machine has been designed to load trucks of the fifty ton class (one of which is shown) in three or four passes, handle the toughest of digging jobs, utilize either electric or diesel-electric power, and take advantage of "amplidyne" or "rototrol" application of electric power.

Separate motors and generators operate the hoist, crowd, and swing motions, and there is an exciter for each generator combination to make the motors immediately responsive to the operator's controls.

Two matching 187½-hp. motors operate the hoist machinery, and through the use of clutches drive the propel mechanism. Twin swing motors are of 62½ hp. and another motor also of 62½ hp., mounted on the boom, provides power for crowding and retract. Air-operated ram cylinders, electrically controlled, are used on the upper frame and crowd machinery.

This machine should have wide application in the mining, quarrying, heavy construction, and coal industries where the hardest, toughest materials must be excavated on a continuous, high yardage schedule to meet adequately demands of increasing production.

### Trackson Co. Becomes Cat Subsidiary

Trackson Company of Milwaukee, a producer of tractor-mounted machines, has become a wholly owned subsidiary of Caterpillar Tractor Company.

It was recently announced that 54,000 shares of Caterpillar common stock was exchanged for all of the capital stock of Trackson. Mr. Louis B. Neumiller, president of Caterpillar, will be chairman of a reconstituted Trackson board of directors which will include Walter H. Stiemke, Trackson president, and the following Cat officials: William Blackie, Ralph M. Monk and J. R. Munro.

Mr. Stiemke and L. E. Dauer, Trackson vice presidents, will continue in their present administrative capacities. Henry Gotfredson, secretary and treasurer of Trackson, wishes to retire and will be succeeded by George L. Scripps, who will relinquish his office as assistant treasurer of Caterpillar.

Trackson's two Milwaukee plants occupy approximately 150,000 sq. ft. of manufacturing and office space. Principle products are traxcavators, tracloaders, pipe layers, swing crane, earth augers, treedozers, brush rakes, angle-graders and anglefillers. The Milwaukee plants employ approximately 440 people.

Trackson products have been sold through Caterpillar dealers for the past 15 years.

### Diesel-Electric Locomotive Proves Profitable to Railway

The Atlantic and Western Railway Company of Sanford, N. C., has increased its revenue while saving more than $700 a month on fuel since replacing two steam locomotives with a single General Electric diesel-electric 70-ton switcher.

The new diesel electric locomotive was put into service more than a year ago on the line which connects the Atlantic Coast Line, Seaboard Air Line and Southern Railroad at Sanford with the Norfolk Southern at Lillington, North Carolina.

### Reclaimed Pipeline Boosts Oil Production

Steel for oil-country tubular goods is in such short supply that oil companies go to almost any lengths to find it. Recently a California oil producer dug up a 38 year-old pipeline, over 40 miles long, from the Mojave Desert where it was no longer being used. The lengths of six in. pipe were trucked 300 miles over 4000-ft. mountains. They were straightened, blasted with pellets, and rewelded into 40-ft. lengths. With this reclaimed pipe, the company will be able to boost production in one oil field from 2500 to 24,000 bbl. per day. This is a good example of how resourcefulness and ingenuity can bring results.

## Gander to Make New Diesel Installation

Gander. Newfoundland has under consideration the installation of another Polar Atlas diesel engine of 1470-hp. This new addition will be similar to the one that was installed in 1949.

Gander is the location of the world's largest airport, which together with other heavy demands has made the installation of more electrical power mandatory.

Another Polar Atlas diesel is being installed in the town of Lewisporte, Newfoundland. This plant now has four Caterpillar 4400 series engines and is installing a 265-hp. Polar Atlas diesel to meet current power requirements. At the present rate of increase of power demands, it is expected that installation of another engine will be required by next year.

## AF Re-refining Oil

In an effort to conserve natural resources the Air Force reclaimed and processed over 1,500,000 gallons of used engine oil yielding over 1,115,000 gallons of re-refined oil as well as financial savings. AF estimates that for every 1000 gallons of new oil issued, 250 gallons of used oil will be accumulated, and 177 gallons of re-refined oil will be recovered. Plans are now under way to also re-refine oil from ground equipment.

## Technical Problems Presented

The National Inventors Council, a voluntary group of distinguished scientists, inventors and industrialists with Dr. Charles F. Kettering, former head of research at General Motors as chairman, is issuing a series of "Defense Problem Sheets". Established prior to World War II, the council serves as a "clearing house" for inventions and ideas which will assist the Armed Services in solving technical problems.

To achieve this, the nation's inventors are invited to submit inventions and ideas on specific problems furnished to the council by the Defense Department. The council publicizes the needs among researchers and inventors, reviews solutions sent in, and refers those which in its judgment are valuable to the appropriate technical branches of the Armed Services for investigation. The Office of Technical Services provides the National Inventors Council with a staff of technical experts in Washington to handle the administrative and clerical work.

The first in this series of problems has already been presented—the need for a light, durable, corrosion-resistant, hand-operated aerosol sprayer for spraying military quarters with insecticide.

## Steel Critical for Railroads

Unless production of more railroad equipment is authorized under the Controlled Materials Plan for the first quarter of 1952 and succeeding months, the Nation's railroads may be unable to fully support a total-war economy should the need arise, the National Production Authority, U. S.

What's your cost ON A MAJOR ENGINE BREAKDOWN?

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**Diesel Applications.** Sounds an alarm . . . closes magnetic fuel valve and sounds alarm . . . closes magnetic fuel valve only . . . closes magnetic fuel valve and opens pilot relay.

**Battery Ignition Applications.** Opens battery circuit and sounds an alarm . . . sounds an alarm only . . . opens battery circuit only.

**Magneto Ignition Applications.** Sounds an alarm only . . . grounds dual magneto . . . grounds magneto only . . . grounds magneto and sounds alarm or lights signal light.

**Dual Ignition Applications.** Opens battery circuit and grounds magneto.

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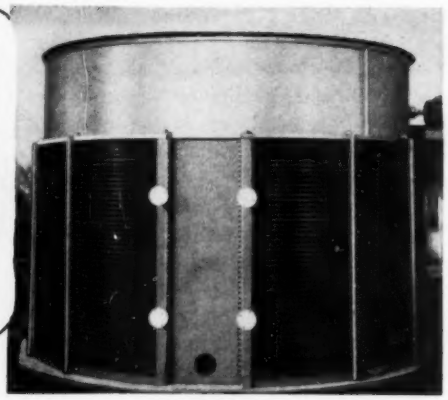

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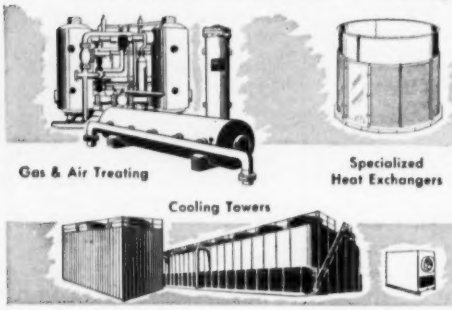


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Department of Commerce, was told at a recent meeting with the Railroad Freight Car Component Parts Manufacturers Industry Advisory Committee.

The freight car component parts manufacturers asked whether the 21,450 total unit freight car program, a reduction from the fourth quarter's 24,500 is part of a long-range plan to reduce their production or is temporary. Unless the freight car program will expand again, committee members said they may have to convert their facilities to production of other types of goods.

The manufacturers reported difficulty in placing authorized controlled-materials (ACM) orders, particularly for structural steel, on mill schedules. This has caused drastic reductions in production lines and created heavy unbalanced inventories, they said.

### Rotex Punch Plant

The Rotex Punch Company of Oakland, California, manufacturers of the "quick change turret punch press" recently announced opening of a second plant location at 5215 East 12th Street, Oakland, California.

Both industrial and government activity demands have made it necessary to add this 7000 square feet to the company's facilities. It is devoted to office space, assembly, warehouse, and shipping.

### Chile's First Refinery

Engineering has been initiated on Chile's first refinery, to be located at a site about ten miles north of Valparaiso.

The M. W. Kellogg Company, awarded the contract by Empresa Nacional Del Petroleo for the $10,000,000 refinery, estimates that actual construction will begin under the direction of its subsidiary, Kellogg Pan American Corporation, in about a year. The refinery, a complete 20,000 bbl. per day plant, will employ modern type combinational thermal processing equipment to produce several petroleum products from either indigenous or imported crude oils.

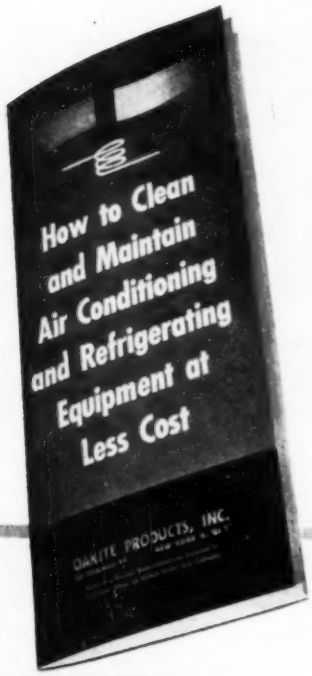
Products from the plant will include, aside from liquified petroleum gases, motor gasoline, tractor gasoline, kerosene, two grades of diesel oil and heavy fuel oil. They will be moved to marketing points by both pipeline and truck.

Process facilities in the combination unit comprise crude oil distillation, vis-breaking, thermal reforming, thermal cracking, gasoline stabilization and treating equipment for sulphur removal from fuel gas, liquified petroleum gases and gasoline.

### "Cat" Expansion Program

Caterpillar Tractor Company announces an expansion program that will include a new factory in York, Pa., extensive additions to the Joliet, Illinois plant, and some improvements in the Peoria, Illinois plant.

The York plant will be built on a site of approximately 130 acres just

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outside the city limits and will cover about 360,000 sq. ft. of floor area. About 1000 persons will be employed. The plant will be devoted to the production of track and track roller parts, and will enable the company to utilize eastern sources of steel which do not now supply its factories in Illinois.

Major additions to the Joliet plant will be a 230,000 sq. ft. extension to the present manufacturing building, a separate parts building covering 280,000 sq. ft., and an addition to the heating plant. The addition will be devoted to the production of service parts.

A new die and fixture building is being built at Peoria to permit future improvement in the layout of equipment in certain other buildings, and to further improve the efficiency of several manufacturing operations.

## Eutectic Expands

The construction of a new wing to house two new research laboratories has been completed by Eutectic Welding Alloys Corporation.

The new building will contain a staff of research chemists and physicists who will concentrate on the development of new welding alloys utilizing fewer critical metals.

## Tasmania Tin Pushed

A big revival of tin mining in Tasmania is reported by the Australian News Summary, which points out that old mines in the area are being reopened and production in mines already in operation is being increased.

"Toward the end of the last century, Tasmania was an important tin producer, but economic factors caused many of the mines to close", it says. "Since then, however, the situation has changed—the overseas price of tin today is about $2240 a ton.

## Instrument Maintenance Courses

Courses in instrument maintenance and repair are being given by the Brown Instruments Division of Minneapolis-Honeywell Regulator Company at the Brown School at Philadelphia. Classes started January 7th.

As in the past, a large part of the six months training for the second

**order it . . .**

**install it . . .**

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**You can do that with ATLANTIC seamless diesel hose which requires no maintenance whatever.**

Absolute uniformity of wall thickness . . . no seams or packed joints . . . absolutely tight against water, oil, steam, gas, air . . . dampens vibration . . . . maintains flexibility at extremely high temperatures.

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semester of the 1951-53 season will be for the benefit of Honeywell customers men. Other periods will be held for the training of company men who will be assigned to field sales and service staffs upon successful completion of the courses.

The schedule will be divided into study periods of varying lengths including a 13-weeks comprehensive course that will extend from February 11 to May 9. Other courses will be held from January 7 to June 27. It is expected that special courses will be held for government engineers, including those from the AEC, from educational institutions and from various friendly nations.

The coming schedule will include studies in pyrometry and electronic potentiometers, pneumatic control and transmission, flow meters, thermometers, pressure gauges and hygrometers, milli-voltmeter type pyrometers, electrically operated automatic control, Moist-o-Graphs, tachometers, resistance thermometers and $CO_2$ and analygraphs.

## Plan to Put Idle Metalworking Equipment to Work

If you or your organization have any idle metal working equipment, you can help the defense effort by sending a list of the available equipment to National Production Authority, Washington, D. C. where it will be passed along to the machine tool builders who are attempting to increase their production 400 per cent. The tool steel is available for the work, according to the steel industry committee, which advises the NPA.

## New Steel Process

A new process of converting pig iron into high grade steel was described recently at the World Metallurgical Congress in Chicago by Dr. Pierre Coheur, director of the metallurgical department of the University of Liege, Belgium.

Conversion of pig iron into steel by this method is made by blasting it with oxygen-enriched air and superheated steam.

While admitting the process is more expensive than the Bessemer process, it is on the other hand cheaper than the open hearth method. At the present time its production rate is about twice that of the Bessemer method.

During his stay in this country Dr. Coheur will discuss the process with leaders of the American steel industry.

## Engineering Teaching Aids Sought

The American Society for Engineering Education is issuing a call to industry, the professional societies, public or private research organizations, and the engineering colleges for teaching aids which may be reviewed in its forthcoming Catalog of Teaching Aid. This publication will contain reviews of all kinds of teaching aids suitable for use in the teaching of various engineering subjects. The first edition of the catalog will be limited to civil, electrical and mechanical engineering, mathematics, and engineering mechanics. This edition will also


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### *Sterling Fuel Consumption Tests*

(*Continued from page 79*)

Some of these factors claimed for units of the type under discussion include: Light weight and compact dimensions reduce problems and charges of transportation; possibility of the use of smaller buildings for housing and lighter foundations for support; and the fact that they can be shipped as completely engineered units ready for operation after positioning by local labor.

From the maintenance point of view, replacement parts are smaller, lighter and less costly. Servicing or repair is more quickly performed without the use of special handling equipment. To support this, the engine builder cites the following: A complete cylinder head, piston and connecting rod assembly can be removed by one man in 30 minutes. Five minutes more are required to remove the liner. Reinstallation, again by one man, is said to be within a 40-minute period.

**Summarizing the Details—**

it can all be boiled down to the fact that the achievement of such low fuel consumption is noteworthy in an engine of this type and size. It could conceivably give some impetous to a current trend for the utilization of completely self-contained units in a broad range of applications.

The automatic control features of the engine-generator sets and their projected use point up still another trend—the increasing use of relatively unattended diesels in scores of stand-by applications.

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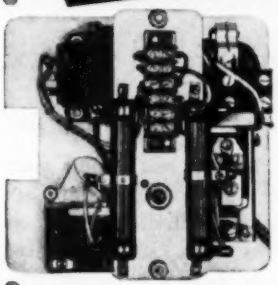

Interior view of Type SR-SF

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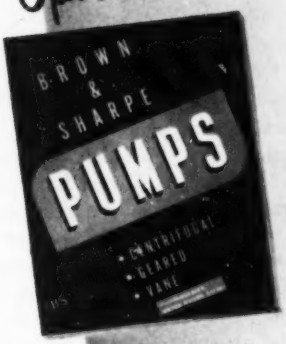


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be limited to motion picture films (sound and silent), slides in 2 by 2 in. or 3¼ by 4 in. size, models, charts and exhibits. Information on such devices should be sent to Professor Carl W. Muhlenbruch, Chairman ASEE Committee on Teaching Aids, Northwestern Technological Institute, Evanston, Illinois, who will see that they reach the proper reviewing group. Each offer of a teaching aid should be accompanied by a written description or photograph and a set of operating instructions.

## Nordberg Branch Office

Establishment of a Nordberg Manufacturing Company branch office in Seattle was announced recently. The company has acquired the entire sales and service facilities of the former Al-Pac Engine & Equipment Company.

Mr. Carl S. Harris has been appointed manager of this new West Coast operation. He has been since 1949 manager of Al-Pac Engine and Equipment Company; which prior to January, 1952 was a distributor for Nordberg in the same territory which is now to be covered by the company's Seattle branch.

## Chicago Metal Hose Changes Name

On January 1, 1952, Chicago Metal Hose Corporation became Flexonics Corporation. The growth of the company and the development of varied product lines made it desirable to select a new corporate name more representative of the broad scope of company activities.

The company is now building its sixth manufacturing plant in Memphis, Tennessee. Scheduled for completion early in 1952, it will be used to expand production of aircraft assemblies.

## Centric Clutch Company Now Meeting Demand Requirements

Unable to meet the unusual demands for centrifugal clutch-couplings, the Centric Clutch Company embarked early this year on a stepped up production program that is now complete.

Occupying a newly erected building in March of this year at Woodbridge, N. J., a four fold increase over previous facilities became available.

Now with a 100 per cent increase in production personnel and sufficient additional equipment, demands for shipment have been met. In addition, a stock reserve of the complete line of Rawson clutches and shoes from fractional up to 300-hp. industrial clutches have been built up. By special order clutches up to 3000-hp. can be furnished.

## Worthington Engines for Natural Gas Pipeline

Twenty-five uniflow angle gas engine compressors have been supplied by Worthington Pump and Machinery Corporation to the Texas-Illinois Natural Gas Pipeline Company for a new line from Southeastern Texas to Joliet, Illinois.

In these engines, the through-scavenging system was adapted to pipeline gas engines for the first time, it is claimed. This system has long been in use in diesel engines and its adaptability to gas engines is the result of

seventy years' research by Worthington.

### Griscom-Russell Moves

Griscom-Russel Company has recently moved their administrative sales and engineering departments from New York City to Massillon for most efficient handling of the company's business in the design and manufacture of heat transfer apparatus.

The move of the company staff to Massillon centralizes the operations at this location, which is served by many railroads and truck lines. An office building at the plant is now nearing completion to accommodate the executive, administrative sales and engineering offices. The New York sales office will continue to be operated as one of the company's branches.

### Fairbanks, Morse Pump Plant

Fairbanks, Morse & Company is scheduling construction of a new pump plant in Kansas City, Kansas.

The new plant will have a machine shop containing 190,000 sq. ft. of floor space, a foundry with 150,000 sq. ft., and an office building with 20,000 sq. ft.

## Book Review

*Kampf Um Eine Maschine* (*The Struggle About an Engine*)—by Eugen Diesel and Georg Strössner, 157 pages, Erich Schmidt Verlag, Berlin, Bielefeld, Munchen, Germany.

*Kampf Um Eine Maschine*, for those who can read German, is well worth reading. The authors have taken upon themselves the task of going through the voluminous records in the possession of the Maschinenfabrik Augsburg-Nurnberg A. G., the Deutsche Museum of the Diesel family and of writing the history of the first American diesel engines. Historically accurate, this book at the same time will appeal to non-technical readers as well as engineers and economists.

A revealing picture of German-American cooperation at the turn of the century is drawn. It tells the story of the first marine diesel engine in the world and deals with such men as the American beer king, Adolphus Busch, and Colonel E. D. Meier. *Kampf Um Eine Maschine* reads like a novel and throws some surprising highlights on many technical, social and economic problems and on the civilization of the age of our fathers and grandfathers.

## Organizational News

### Union Carbide & Carbon Appoints

Adger S. Johnson has recently been appointed president of National Carbon Company, a division of Union Carbide and Carbon Corporation. He has been vice president and general manager of National Carbon since May 1950.

Mr. Johnson started with the division upon his graduation from Virginia Polytechnic Institute in 1928. In 1933 he was assigned to the Eveready battery plant in Shanghai, China and

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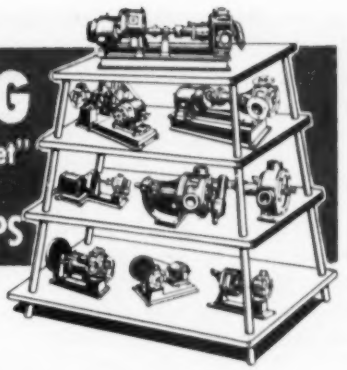

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When you specify Viking, there is no compromise. They fit the job at hand.

Nowhere else can this *complete line of rotary pumps* be duplicated. When your needs must be fully met, consult Viking for the answer. To start, ask for Folder 52SD today.

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by 1939 he had become plant superintendent. In the latter year he was recalled to the United States where he served as superintendent at several plants, and in 1944 he was made assistant to the vice president in charge of production. In 1948 he became vice president in charge of foreign plants, and in 1950 he was appointed vice president and general manager.

### G-E Retirement

W. J. Walker, a member of the sales manager's staff of the General Electric Company's locomotive and car equipment department at Erie, Pa., has retired after 45 years of service with the company.

A graduate of North Carolina State College with a B.S. in electrical engineering in 1905, Mr. Walker joined the company's test program in 1906. After three years he transferred to the central office, and joined the Transportation Division in 1912.

In 1924 he joined the Railway Supply and Renewal Parts Division. He was named manager in 1931, a position he retained until being named to his last post in 1947.

### Fairbanks, Morse Promotes

Promotion of D. C. Prescott, district manager in St. Louis of locomotive sales, to middle western regional sales manager with headquarters in Chicago, was announced recently by Fairbanks, Morse and Company.

*D. C. Prescott*

Mr. Prescott joined the company in 1949. Previously he was with the Baldwin-Lima-Hamilton Company and the Union Pacific Railroad Company.

### New Sales Manager

William O. Merritt has been named sales manager of the Dynamometer Division of the Clayton Manufacturing Company of El Monte, California.

Mr. Merritt, who came to the company in 1950 as sales promotion and advertising manager, will handle all domestic and Canadian sales and advertising activities of the division. He replaces D. T. Ankeny who resigned to enter his own business. Merritt was formerly director of training and sales promotion for the Bear Manufacturing Company of Rock Island, Illinois.

### John Reiner Sales Manager

Herman B. Robbins has recently been named as sales manager of the Generator Set Division of John Reiner & Company, Long Island City, N. Y. This division handles the distribution and sales of D. W. Onan generator sets as well as the John Reiner line of diesel and gasoline generator sets, marine auxiliaries and oil field units.

In addition to his regular duties, Mr. Robbins will also be in charge of all the export activities of the company.

### Borg Warner Appointments

Appointment of Robert J. Minshall as president and general manager and of G. V. Patrick as vice president and assistant general manager of the Marvel-Schebler Products Division of Borg Warner Corporation was announced recently.

Mr. Minshall also is president of the Pesco Products Division at Bedford, Ohio and the Wooster Division at Wooster, Ohio. Mr. Patrick, who joined the corporation in 1948 as eastern sales manager for Pesco, was transferred to Decatur in 1950 as assistant general manager of the newly established Marvel-Schebler Products plant.

The reorganization of the division's executive staff was occasioned by the retirement from the presidency of S. W. Gray.

### Cummins Man Named to Metallurgical Board

Harold H. Lurie, chief metallurgist, Cummins Engine Company, Inc., has been named a member of a six man

*Harold H. Lurie*

metallurgical advisory board to assist the United States Navy on a special technical project. His appointment was announced by the American Society for Metals.

A 1923 chemical engineering graduate of the University of Illinois, Mr. Lurie also holds a Master's degree from Purdue University. Before joining Cummins in 1939, he was chief metallurgist for Ross Gear & Tool Company, Lafayette, Indiana. For a number of years, he was a research associate at Purdue University's engineering experiment station.

### GM Diesel Appointment

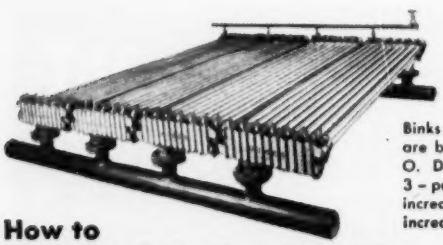
John W. Brophy, formerly director of purchasing and production control, has been named acting general manager of General Motors Diesel, Ltd., London, Ontario.

The Canadian government earlier has announced that E. V. Rippingille, Jr. president and general manager of the company had been made director of the aircraft division of the Canadian Department of Defense Production. Mr. Rippingille will continue as president of the company.

### Minneapolis-Honeywell Change

W. L. Gustafson has been named power industry sales manager west of the Mississippi river for Minneapolis-Honeywell Regulator Company.

Gustafson, who will make his headquarters in San Francisco, has been with the company since 1926. He represented the firm in the St. Louis-

Binks Type "D" coils are built of heavy 1" O. D. copper tubes. 3 – pass arrangement increases fluid velocity, increases efficiency.

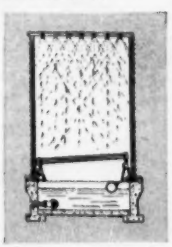
How to
**SAVE COOLING WATER...**
**and insure uniform heat transfer**

When you use Binks Type "D" Heat Exchange Coils, here's what happens:

Hot water from the engine is pumped through the copper tubes of the coils (shown above). The coils are cooled by spraying them with raw water in a standard Binks cooling tower. Because jacket water is circulated through a completely closed system with virtually no evaporation, distilled or chemically pure water can be used economically in the jacket. This eliminates scale formation...increases engine efficiency.

The raw water used for cooling the coils is also recirculated. The only additional water needed is that to compensate for evaporation in the tower.

**Send now for Bulletin 41** for complete engineering data.



View showing placement of Binks Type "D" heat exchange coils in a cooling tower in relation to the spray system (at the top).

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St. Paul offices, and was transferred to San Francisco in 1947 where he has been industrial manager. In his new post he will concentrate on all phases of the power an central stations industries.

### Williard Elects

E. M. Slonaker has recently been elected vice president in charge of

*E. M. Slonaker*

sales of the Willard Storage Battery Company of California.

Mr. Slonaker formerly was manager of related products for the parent company in its Cleveland headquarters. He joined the company in 1926 and has served as retail service manager in Philadelphia and special sales representative in Atlanta, Minneapolis, Dallas and Chicago. Prior to his appointment as related products manager in 1949, he was district sales manager in Chicago.

### Link-Belt Man Elected President of Conveyor Eqjuipment Manufacturers Ass'n.

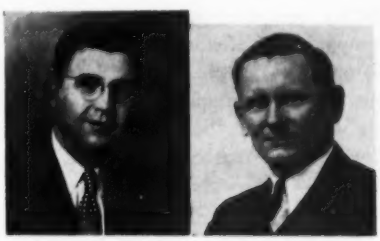
G. Walter Ostrand, general manager, Caldwell Plant, Link-Belt Company, was elected president of the Conveyor Equipment Manufacturers Association at the recent annual meeting.

### "Cat" Executives

Two Caterpillar executives have been named to direct expansion of facilites and operations at Joliet, Ill. and York, Pa.

T. R. Farley, a vice president, will go to York early this year to establish a temporary office as construction of the new plant gets under way. He has been in charge of special projects for the parent firm in Peoria.

William L. Naumann, assistant general factory manager at Peoria, succeeds Farley as general manager of



*William L. Naumann* *T. R. Farley*

the Earthmoving Equipment Plant at Joliet.

### Penn Changes Name

The firm name of the Penn Electric Switch Company has been officially changed to Penn Controls, Inc. Over the years the company's product line has grown to include many

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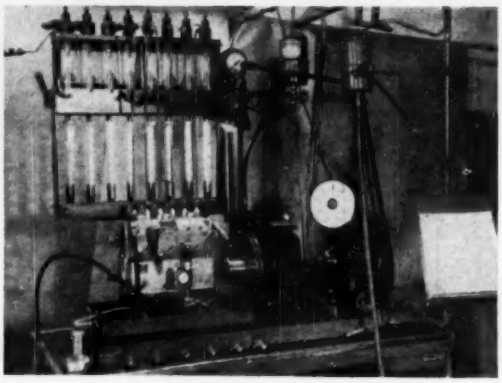

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items other than electric switches, and the name has been changed to better fit all products manufactured.

### Round Associate Chain Companies President

William J. McElroy has been elected president of the west coast companies of Round Associate Chain Companies—Seattle Chain & Mfg. Co., Seattle and Portland; Round California Chain Co., So. San Francisco; Round Los Angeles Chain Co., Los Angeles. He will continue as general manager of Seattle Chain.

Mr. McElroy has been in the chain business since 1917, when he was appointed manager of the Virginia Chain Company in Parkersburg, West Virginia. Later he represented the Cleveland Chain & Mfg. Co. in New England and northern New York.

The Seattle Chain & Mfg. Company was acquired by the Round group in 1920 and Mr. McElroy was placed in charge as vice-president of the newly organized Round California Chain Company.

### Mack Appointments

Mr. H. Bernard, chief engineer of Mack Trucks, Inc. since 1948, has been appointed vice president in charge of service of the corporation. Mr. T. J. Zeller, who has been manager of the Allentown, Pa. factory since 1943, has been made vice president and chief engineer.

*H. Bernard*

*T. J. Zeller*

Mr. A. C. Schliewen, factory manager at Plainfield, has been appointed manager of the Allentown factory. Succeeding him is Helmer Peterson, formerly manager of the Long Island City, N. Y. plant.

### Link-Belt Research Director

Appointment of Dr. Lauriston C. Marshall as director of Link-Belt Company's new physical testing and research laboratory at Indianapolis has been announced.

Dr. Marshall has been professor of electrical engineering at the University of California. He is currently head of the Microwave Laboratory operated at Berkeley under the joint sponsorship of the U. S. Air Forces and the Research Corporation. He is also a member of the University's radiation laboratory staff which has been carrying on nuclear research for the Atomic Energy Commission. He will take over his new duties with Link-Belt as rapidly as he can be released from his present projects.

### Borg-Warner Change

Ingersoll Products Division, Borg-Warner Corporation, recently announced changes in responsibilities at the Chicago works.

James H. Ingersoll, vice president, is now in charge of all contract and defense sales. Reporting to him will be A. J. Robertson, new manager of defense sales, and L. R. Miller, new manager of contract sales.

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## *Organizations*

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### "Cat" Board Chairman

Harry H. Fair was recently elected chairman of the Board of Directors of Caterpillar Tractor Company. He succeeds C. L. Best, who died a while ago.

Mr. Fair's connection with the tractor business dates back to 1918 when he became a stockholder and director of Best Tractor Company, one of the Caterpillar constituents. He was the prime mover in the formation of Caterpillar and has continuously been on its board and executive committee.

### Mack Change

F. W. Beardslee, vice president of Mack Motor Truck Corporation, has been named assistant general manager of the company's export division, with headquarters in New York.

Mr. Beardslee became associated with the company in 1919 and has been manager of the fire apparatus division since 1940.


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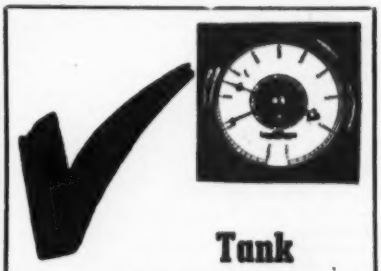

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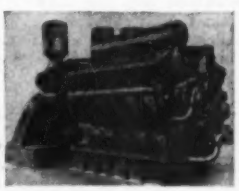

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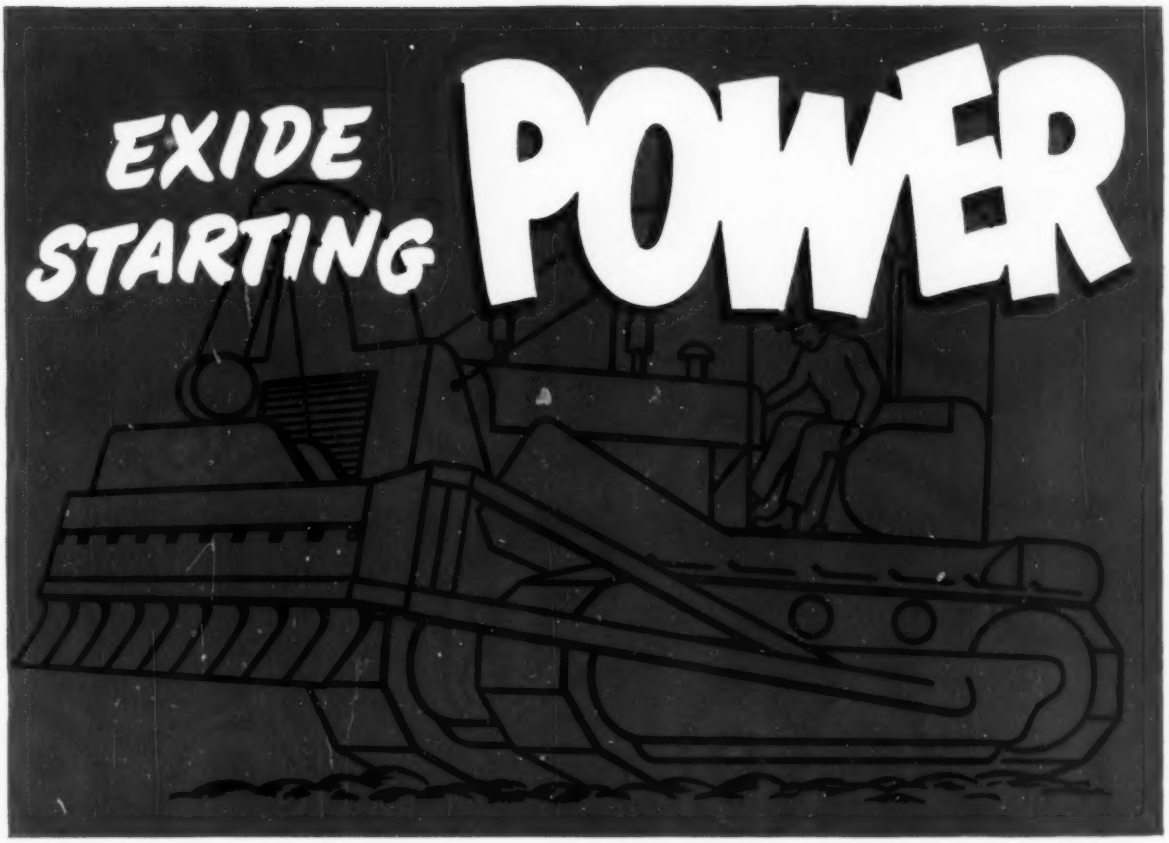


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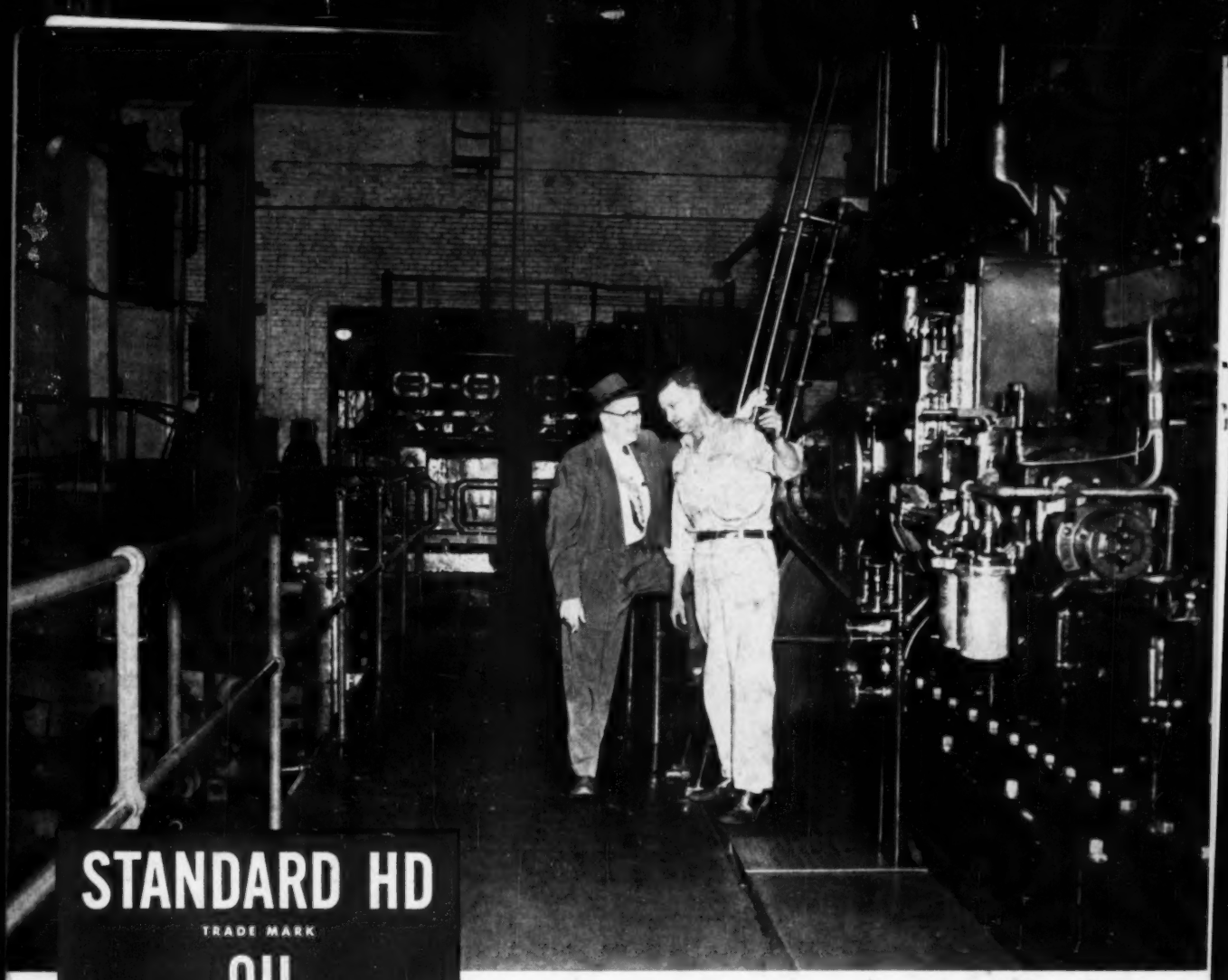


# Solves a diesel maintenance problem

• Excess cylinder and ring wear plus sludge, varnish, and carbon deposits posed a costly maintenance problem for operators of this municipal power station. Overhauls were scheduled every six months. A full set of rings was installed at every overhaul. That was the situation in 1947 when a Standard Oil lubrication specialist recommended changing to STANDARD HD Oil.

The change was made on one of the station's five diesels. These are the results with STANDARD HD.

Time between overhauls has been doubled, and normally only the two top rings are changed. Cylinder wear has been cut to a minimum, even with the engine operating under heavier loads. The engine has remained clean and there has been no ring sticking. Efficiency has been stepped up from an average of 12.0 KW per gallon of fuel to 12.5 KW per gallon.

These results, the solution of a costly maintenance problem, have led to the use of STANDARD HD Oil in the station's four other diesels. Chances are that a Standard Oil lubrication specialist can help you achieve similar results in the operation and maintenance of your own diesel equipment. Put him to work on your problem today. A call to your local Standard Oil Company office is all that's necessary. Or write: Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Ill.

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